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VOL. 33 JULY, 1957 No. 3

MEGALOPOLIS
OR THE URBANIZATION OF THE NORTHEASTERN SEABOARD

Jean Gottmann

Dr. Gottmann, Professor at the School of Political Science, University of Paris, is on leave to direct for The Twentieth Century Fund a research project, "A Study of Megalopolis." He is also a member of the Institute for Advanced Study, Princeton, N. J.

THE frequency of large urban units scattered along the Atlantic seaboard in the northeastern United States was a striking realization to the foreigner who first visited the area, even 15 years ago. In February, 1942, after a first trip from New York to Washington, the writer, being asked by Isaiah Bowman in Baltimore what was the most striking impression he had had as a geographer in his first months in this country, answered: "The density of great cities along this coast, from Boston to Washington."

In 1950, on the basis of the new census, the Bureau of the Census prepared a map, later published as an illustration to a booklet of statistics on *State Economic Areas*, which showed clearly the continuity of an area of "metropolitan" economy from a little north of Boston to a little south of Washington, more precisely from Hillsborough County in New Hampshire to Fairfax County in Virginia. This seemed to be a first statistical demonstration on the map of the existence of a continuous stretch of urban and suburban areas, the main NE-SW axis of which was about 600 miles long, and within the frame of which dwelt even in 1950 some 30 million people.

In the geography of the distribution of habitat this was a phenomenon unique by its size not only in America but in the world. It resulted obviously from the coalescence, recently achieved, of a chain of metropolitan areas, each of which grew around a substantial urban nucleus. The super-metropolitan character of this vast area, the greatest such growth ever observed, called for a special name. We chose the word *Megalopolis*,[1] of Greek origin, and listed

[1] The term *Megalopolis* was preferred to others after careful consideration of various possibilities. We wish to express our appreciation for the help received in this matter from several distinguished classicists at the Institute for Advanced Study, especially from Professors Harold Cherniss, Benjamin Merritt, and the late Jacob Hammer. "Megalopolis" was used by various authors in connection with quite different meanings: ancient philosophers described sometimes by it the "world of ideas"; recently Lewis Mumford used it to describe the whole trend towards large cities. We have felt it appropriate to describe a unique geographical region, characterized more than any other by enormous urban and metropolitan growth, and to assess the present status of a vast region in the northeastern seaboard section of the United States. Our statistical definition as on the maps is based on the map accompanying the Bureau of the Census publication: *State Economic Areas* by Donald J. Bogue, Washington, 1951.

in Webster's dictionary as meaning "a very large city."

Indeed, the name "Megalopolis" appears on modern maps of Greece, designating a plateau in the Peloponnesus. A city was established there in ancient times, the founders of which dreamt of a great future for it and of an enormous size. But the Greek town of Megalopolis never grew to be much of a city. What has developed now in the northeastern seaboard surpasses everything dreamers of the past may have visualized. Aristotle, however, wrote in his *Politics:* "When are men living in the same place to be regarded as a single city? What is the limit? Certainly not the wall of the city, for you might surround all Peloponnesus with a wall. Like this, we may say, is Babylon and every city that has the compass of a nation rather than a city." (III, 3, 1276a, 25.)

A few years ago the reviewer of a book on the history of eastern railroads referred to the stretch of land along the tracks of the Pennsylvania and Baltimore and Ohio Railroads from New York City to Washington, D.C., as the "Main Street" of the nation. To be quite correct, such a "Main Street" ought to be prolonged along the rail tracks from New York City to Boston. There is, however, some truth in this symbolical expression. This section of U.S. 1 has come to assume within the American nation a special function, or a whole group of intertwined functions, which is hinted at in less urbanized areas by the concept of Main Street.

WHAT IS THE MEANING OF A STUDY OF MEGALOPOLIS?

Geographers are of course convinced of the value of a study describing a given geographic region endowed with some unity and originality, and thus differentiated from neighboring areas. Although such a region may be unique in the world, investigating its features, problems, and structure has generally been recognized as a worthwhile enterprise. As the data describing unique cases piled up, the endeavor developed in the geographical profession to look for general principles and for studies of cases, the outcome of which would be more immediately valuable because they are applicable to some extent in more than one area or place.

Although unique today, *Megalopolis* obviously has been and still is an extraordinarily interesting laboratory *in vivo* where much of what may well be accepted as the "normalcies" of the advanced civilization of the latter part of the twentieth century is slowly shaping. It still is too early to assess the full meaning of a study of Megalopolis in the frame we have outlined. The study must first be carried out. The many questions it involves could not be listed, let alone discussed, in such a brief article. A few hints may be given, however, of what such a survey could mean and of the main problems it could tackle.

By its size and mass, Megalopolis is both an exceptional growth and a pioneer area; exceptional, for nowhere else could one find another concentration of population, of industrial and commercial facilities, of financial wealth and cultural activities, comparable to it. However, in several other points in America and on other continents growth of continuously urbanized spaces may be observed. More of such enormous "metropolitan" bodies can be expected to arise as the evolution, already well advanced in and around New York, Philadelphia, Boston, Washington, reaches other cities and their environs. In this sense Megalopolis is a pioneer area: the processes which develop therein will help toward an understanding of,

and will forecast ways and obstacles to, urban growth in various other parts.

In fact Megalopolis has already been pioneering in the organization of urban life for quite some time. Such features as skyscrapers, building elevators, city and suburban networks of trains, traffic lights, and one-way streets started here on a large scale to gain later world-wide adoption. Megalopolis grew up from the network provided by the early mushrooming of sea-trading towns along the coast from Boston to New York and then, along the Fall line, from New York to Washington. The size of its principal urban nuclei, especially New York and Philadelphia, caused the subsequent mushrooming of suburbs filling in the spaces between the larger cities. James Madison defined New Jersey as a "barrel tapped at both ends"; that this state's function was essentially to link the area of New York and Philadelphia was apparently understood by such a clever observer at the end of the eighteenth century. But the polynuclear origin of Megalopolis is beginning to be repeated in other regions. A vast urban and suburban area is rapidly expanding around Los Angeles, for instance; inland it has already reached, in fact, San Bernardino; it may unite with San Diego on the coast. Around Chicago, on the shore of Lake Michigan, another impressive urban continuity is shaping. The metropolitan areas stretching in Ohio between Cleveland and Pittsburgh are close to coalescence; and the St. Lawrence Seaway, once opened, may accelerate and expand these trends in the area south of Lakes Erie and Ontario. And as more metropolitan areas are pushing forth suburban tentacles one towards another throughout the nation, additional but smaller Megalopolis-like clusters will be formed. This is a process involving considerable changes in the American modes of living.

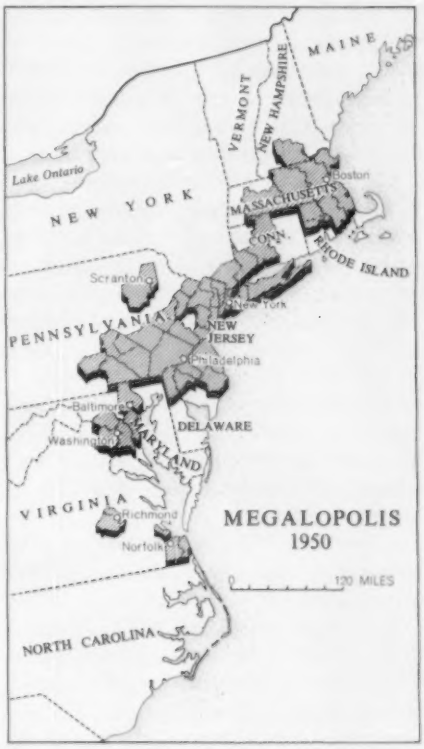

FIG. 1.

The trends may become better understood once the case of the largest and most advanced of these areas, the present Megalopolis, is thoroughly analyzed.

WHAT ARE THE PROBLEMS OF MEGALOPOLIS?

Within such a vast area the problems are, of course, many and diversified. It may not be necessary, nor very useful, to survey all of them, in their local variety, in the different parts of Megalopolis. A few basic questions must, however, be asked: How did Megalopolis happen to arise and with such a shape? What are the present main functions of this area, its role within the American economy and the North Atlantic system

of relations? What are the present problems of internal organizations, and what solutions have been attempted?

Here are three sets of questions, each of which requires detailed consideration, involving a great deal of research.

Megalopolis' growth in the past sums up a good part of the economic history of the United States. It has not often been examined as to how the sequence of events and trends in the past growth of the nation affected local developments. Although it is, in area, only a small section of the Northeast, Megalopolis had a crucial part in determining national trends; on the other hand, the main swings of its own history were usually the consequence of shifts in national policies.

Why was Megalopolis' growth throughout its history more rapid and continuous than that of many other urban areas in the world? This question leads into an examination of the factors motivating or determining urban expansion in a given area. In a first inquiry concerning the matter conducted by this writer a few years ago were listed some forty-odd factors that in different ways and at different periods helped the upbuilding of Megalopolis. The two major among these factors appear to be, on the one hand, the polynuclear origin and the part played by the series of northeastern seaboard cities as a *hinge* of the American economy. The federal organization of government and the division of the Atlantic seaboard into so many states (each with access to Tidewater) that engaged in a fruitful rivalry made all nuclei compete one with another until their growth joined them together.

The role of the "hinge" is more difficult to perceive, but is easily demonstrated by the material accumulated in regional economic history. This seaboard had from the inception of the United States the opportunity and the responsibility of serving both as an oceanic façade for relations abroad and as a springboard for the settlement and development of the continent inland. At different periods the main weight of the northeastern interests oscillated from sea trade to continental development and back again; in New England one of these oscillations in the beginning of the nineteenth century was defined as the period when the main interest shifted "from the wharf to the waterfall." In many towns which, on the Fall line, were later integrated with the area of Megalopolis, wharf and waterfall were very close to one another. Whether the general trends of the American economy threw the door open towards the outside or closed it to turn the main endeavors inland, the hinge remained fixed at the series of eastern cities, extending from Boston to Washington, which alone had the geographical position, the authority, the capital, and the skill to elaborate such policies and put them into application.[2]

The inheritance of the past still influences heavily present situations and trends. Whether the eastern seaboard will keep the monopoly of the "hinge" advantages after the St. Lawrence Seaway is completed remains a burning question. However, the faculty of direct access to the sea was only one of many factors which favored Megalopolis and the others may still operate in the future. The relative part played by these various factors in shaping the present would be an important and suggestive aspect in the study of Megalopolis' historical background.

The present functions of Megalopolis

[2] See the historical sketch of the "hinge" function in J. Gottman: "La région charnière de l'economie americaine," *Revue de la Porte Océane*, Le Havre, VII, Nos. 71 and 72, March, 1951, pp. 9–14, and April, 1951, pp. 11–20.

would be the next step in the proposed research. These functions are several; there is, of course, a residential one expressed in the total figure of the population; but how do the inhabitants make a living and why do they have to be concentrated in this area?

Megalopolis arose as a grouping of the main seaports, commercial centers, and manufacturing activities in the United States. To a large extent the *maritime façade function* still is carried on: most of the seaborne foreign trade of the country goes through Megalopolis' harbors. The *manufacturing function* never stopped developing within the area, although many industries have been brought into operation in other sections of the United States. Megalopolis seems to specialize rather in the more delicate finishing industries and in those involving a great deal of laboratory work and research. However, a good number of large plants (iron and steel, chemical and metallurgical industries) have been erected within the last 20 years in this same area. What the balance is and how much specialization is really shaping up would be interesting to ascertain.

The *commercial and financial functions* remain extremely important for Megalopolis. Despite decentralization trends many times stressed and advocated, this area remains a decisive one for the American economy as well as for international financial relations. If New York City is no longer the financial capital it was earlier in the century, it is because much of that function migrated to Washington, with the increasing role of federal authorities in the management of the nation's business. As a market, for goods as well as for money, Megalopolis as a whole still dominates the rest of the national territory. Not only does it comprise one-fifth of the nation: this fifth is obviously the best paid and the wealthiest. Though other centers of concentrated wealth have arisen and developed elsewhere, especially on the West Coast and along the Great Lakes' shores, none can yet boast a mass approaching that of the Boston-Washington region. Nor has any had such a traditional grouping of financial and social activities as that suggested by some of New York's thoroughfares: Wall Street, Park Avenue, or Fifth Avenue, all fractions of the national Main Street.

Whether or not related to the social stratification and the abundance of money in the area, Megalopolis acquired and retained a quite remarkable *function of cultural leadership*, despite the American endeavor at decentralization. Here are found the best-known universities, the better-equipped laboratories, the greatest density of learned institutions and large libraries in North America, and probably in the present world. The vast majority of nationally-read periodicals and important publishing houses have their editorial offices in Megalopolis; some newspapers from this area have even a nationwide distribution, especially for their Sunday editions. The concentration of cultural leadership makes it difficult for institutions such as the Ford Foundation or the R.C.A. Research Laboratories to operate from headquarters located far from Megalopolis. This leadership is even more evident in the arts: whether theater, music, or galleries, the concentration attained in this area has no match elsewhere in America.

Finally, the question may arise, and would be more difficult to answer, as to the actual weight of Megalopolis in the political life of the country. Although the national capital is part of it, this region is only one-fifth of the nation and its votes do not necessarily make the

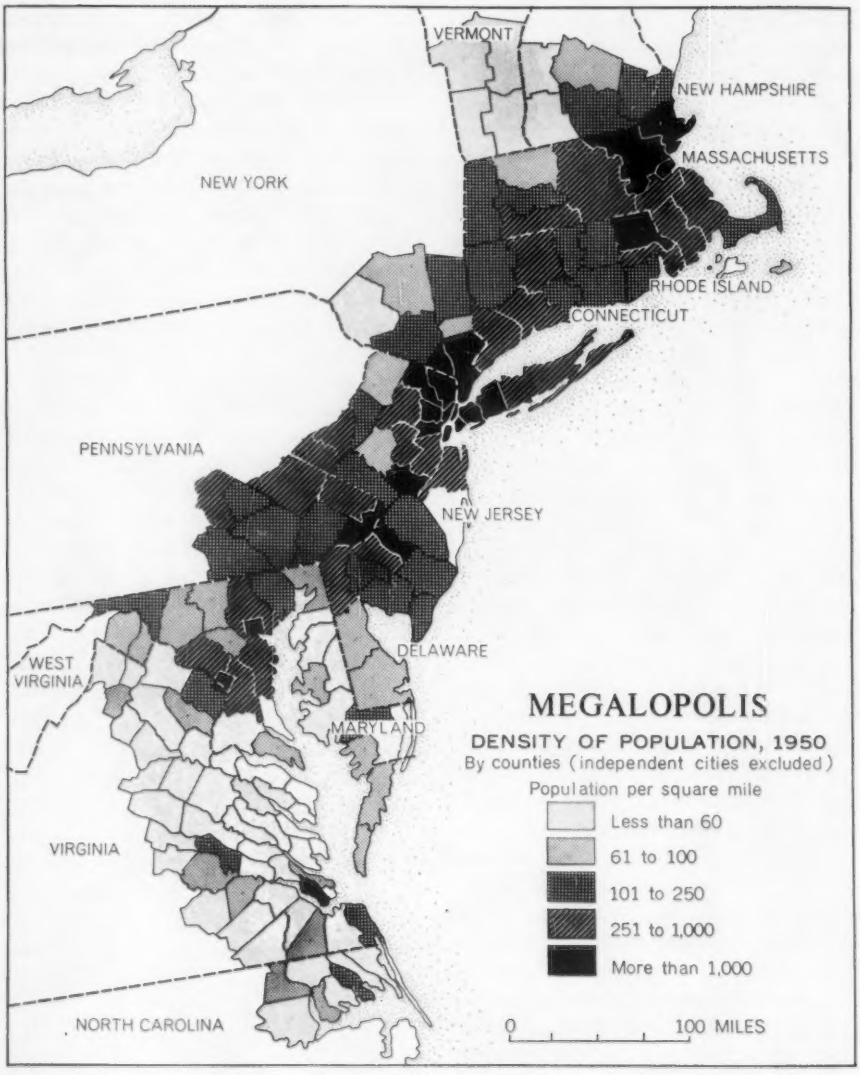

FIG. 2.

decision of major states, parts of which are megalopolitan, such as New York and Pennsylvania. Nevertheless, Megalopolis has a definite political pattern which differs from that of the surrounding northeastern country.

Having thus analyzed the past growth and present functions of Megalopolis, we come to its actual problems. These are many. Two categories of problems, particularly pressing in all downtown sections of modern cities, have attracted attention and have been given much study: the traffic difficulties and the slums. Two other problems are nowadays receiving increasing attention in

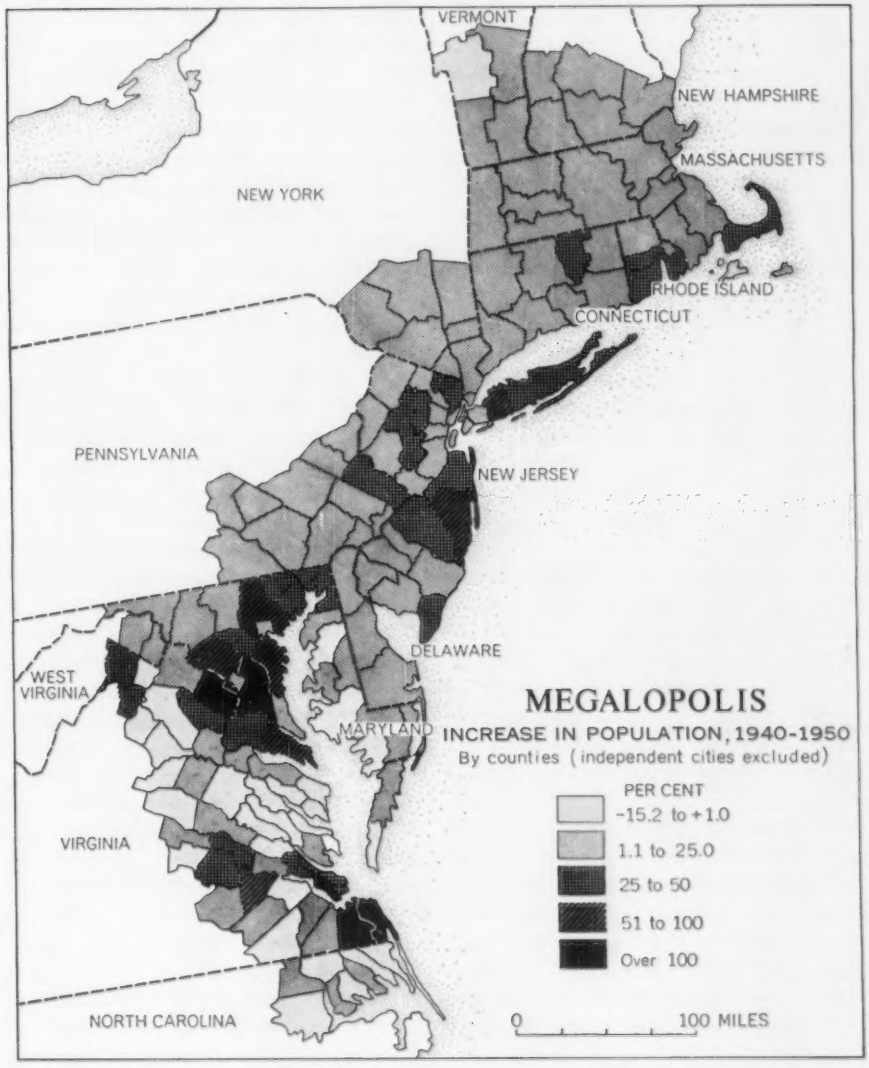

FIG. 3.

competent quarters: water supply and local government. Both appear inadequately set to answer the present needs of the huge cities and their quickly expanding suburbs. The rapidly mushrooming metropolitan commissions and committees seem to herald already deep changes forthcoming in the traditional concepts and practices of local government. Interstate compacts may arise to help solve transportation problems (such as the Port of New York Authority); experiments in metropolitan government may be more difficult to start in parts of Megalopolis because of the mass and variety of interests at stake—

but the very difficulties make every attempt more significant.

Megalopolis as a unit has taken shape only within the last few years. Its laws and customs will take much longer to evolve into new forms better adapted to the needs and resources of such an enormous urban territory. A survey of the new problems, in their variety, should nevertheless be of some help even at this time. While legislation and institutions change slowly, modes of living evolve far more rapidly. Novelists have satirized certain aspects of megalopolitan life: a quarter century after the "cliff-dwellers" were strongly established on Fifth and Park Avenues, we hear about the "exurbanites." The basic fact is the double trend of the large cities: part of the population moves out and commutes from an "outer suburbia" which often extends 50 miles beyond; and parts of the cities are converted into immense apartment house groupings (paradoxically sometimes called "villages"). These two trends are particularly clear in Manhattan and in Washington, but they are gaining other big nuclei of Megalopolis as well. The threat of the recent spread of juvenile delinquency seems to increase the migration of families to the periphery of metropolitan areas. The new mode of life involves more daily traveling, more traffic jams, and more highways outside the downtown areas; a redistribution of marketing channels (illustrated by proliferating suburban shopping centers and department store branches); some changes in the type of goods needed; an increasing interest in zoning, gardening, and nature conservation.

Because more megalopolitan, the way of life of an increasing proportion of the population becomes more country-like although not really rural. The Bureau of the Census has had to revise several times its standards for the definition of metropolitan areas; the criteria of integration with the central urban district include such measurements as the proportion of commuters and the average number of telephone calls per subscriber from a suburban county to the central county of the area, etc. In 1950 the Bureau even had to revise its definition of "urban territory" and introduced the term "urbanized areas" to provide for a better separation between urban and rural territory in the vicinity of large cities, especially within metropolitan areas. New suburban types of farming are also developing, consisting both of a few highly mechanized and specialized large enterprises (such as the truck farming on Long Island) and a scattering of numerous small farms inhabited by people working in the cities and deriving their income from nonagricultural occupations.

The city, in the days of yore, was a well-defined, densely settled territory, often surrounded by walls or palisades. Some time ago it broke out of such rigid frames and developed outlying sections, *extra-muros*. In its most recent stage of growth, already characteristic of Megalopolis, it extends out on a rapidly expanding scale, along highways and rural roads, mixing uses of land that look either rural or urban, encircling vast areas which remain "green" (and which some wise endeavors attempt to preserve as recreation space for the future), creating a completely new pattern of living and of regional interdependence between communities.

The coming of age of Megalopolis thus creates, besides problems in legislation, traffic, engineering, marketing, etc., also new psychological problems: people have more difficulty thinking along the traditional lines of division into states when megalopolitan sections of different states are much more integrated in

daily life than they could be with upstate areas of the same "Commonwealth"; people have also some difficulty adapting themselves to such a scattered way of life; and officials are often lost when trying to classify according to the traditional categories of urban, rural, rural non-farm, farming, etc. Such are, too briefly reviewed, the various problems of Megalopolis. They are worth analyzing for the conclusions that may follow.

LESSONS FROM AN ANALYSIS OF THE MEGALOPOLITAN PROCESS

A detailed analysis of Megalopolis, as it appears today, seems a worthwhile enterprise despite the present unique character of this region. Its trends acquire immediate national, and sometimes international, significance by the sheer size and weight of Megalopolis in economic and social matters. But it is also, as has been shown, a pioneering area in terms of urbanization. What is observed and experimented with here may serve, though on a smaller scale and in many cases only after some time, to avoid delays and errors in other growing urban areas. It may help improve our management of the intricate process of urbanization.

This process is an old one and has greatly contributed, as many authors have shown, to the growth of western civilization. Far from having reached its optimum, in the middle of the twentieth century, the process of urbanization accelerated its pace. The United States has demonstrated that enough agricultural commodities of all kinds can be produced for a populous nation, enjoying a high standard of living, by the work of only one-eighth of the total population. This proportion of the farmers within the nation may and probably will be further reduced. Thus 90 per cent of a prosperous nation must live from nonagricultural pursuits, but not in congested slums. This momentous evolution, one of the major American contributions to this century, leading to semiurbanized status, is most advanced in Megalopolis.[3]

The new forms thus attained, the intensity of the problems, the solutions attempted, must be compared to what happens in all these respects in other principal metropolitan areas in the United States and perhaps in Canada. A clearer mode of classification for both problems and possible solutions may thus be worked out, based on factual observation rather than generalized theory. The whole survey may help to evaluate this new expanding frontier of the American economy: the urbanization of the land.

Outside the North American continent many other countries are already faced with a similar acceleration of the process of urbanization. Their policies could greatly benefit from a full analysis of Megalopolis today and its comparison with other urban growths in America. None of the continuous chains of metropolitan areas or conurbations shaping now in other parts of the world is indeed comparable in size or shape as yet to the American Megalopolis. The one most nearly approaching it, which may perhaps coalesce sometime within the next 20 years, would be in our opinion in northwestern Europe, from Amsterdam to Paris, including perhaps a bulge eastwards as far as the Ruhr and Cologne along the Rhine and Meuse rivers.

Another possible super-metropolitan system of this kind could well be forming in England. A giant U-shaped urban

[3] See J. Gottmann: *L'Amérique*, Paris, Hachette, 1954, 2nd ed. revised, pp. 170–177 and 244–246; also "La ville americaine," in *Geographia*, Paris, No. 48, September 1955, pp. 9–14; and *Virginia at Mid-Century*, New York, 1955, pp. 473–479.

chain surrounds the southern Pennines, extending from Liverpool and Manchester to Leeds and Bradford, via Birmingham and Sheffield. This U may some day unite southwards with the expanding suburbs of Greater London. Then the whole system may enter the megalopolitan family. It would remain, nevertheless, quite different from Megalopolis on the northeastern seaboard. Each large area of such kind will long keep its originality, resulting from its own past and its relation to a given zone of civilization. Large urbanized areas do not need, however, to grow up to megalopolitan size to be able to profit by the lessons in metropolitan organization obtained in Megalopolis.

How Far Could Megalopolis Grow?

Several important studies of the metropolitan areas around New York City, Philadelphia, etc., are now in progress. These surveys will attempt to forecast future growth, by projecting curves for the next 10 to 25 years. Urban and suburban territory is expanding at a fast pace in the United States, and this pace has been notably accelerated in recent years. A vast area like Megalopolis would not have arisen without it. The time has perhaps come to ask once more the question: How far could Megalopolis grow? And in which directions?

In 1955, a group of city planners at Yale University began to speak about a citylike, well-knit system extending from Portland, Maine, to Norfolk, Virginia. Such may be the impression provided by road transportation maps. This writer's observations on completion of a study of Virginia by January, 1955, did not seem to warrant as yet the absorption into Megalopolis of more than a few counties in northern Virginia. Richmond and the Hampton Roads area had not yet been consolidated with the Washington-to-Boston more intensely urbanized system. Beyond eastern Massachusetts northwards, urbanization was felt mainly in the summer as a seasonal migration of vacationing or semivacationing people from Megalopolis. However, there could be no doubt that Megalopolis is daily expanding its territorial scope. Our definition (see Fig. 1) based on the census of 1950 is certainly an underestimation in area for 1957.

Expansion proceeds in many directions, of course, all around the outer fringes. Consolidation of the urban land use within the 1950 limits goes on at the same time. The existing densities of population (see Fig. 2) and the trends of increase of this density by counties in the recent past (see Fig. 3) concur in stressing a relative saturation of most of the areas within Megalopolis between Philadelphia and Boston. Although a great deal of new construction still goes on even in those parts, the more striking increases appear in the southern section of Megalopolis and an expansion in the Virginian Tidewater and northern Piedmont seems unavoidable.

Thus Megalopolis is pushing southwards and southwestwards. It may indeed reach Richmond and Norfolk some day in the foreseeable future. Another set of directions, this time inland, and breaking away from the fateful axis of U.S. 1, may be inferred from an attentive examination of the distribution already in 1950 of the metropolitan areas in the northeastern section of the United States, between the Atlantic seaboard, the Great Lakes and the Ohio Valley (see Fig. 4). A rather impressive density of such metropolitan areas is found inland along the route of the New York Central Railroad up the Hudson-Mohawk route and the southern shores of Lakes Erie and Ontario. Then from Cleveland south-

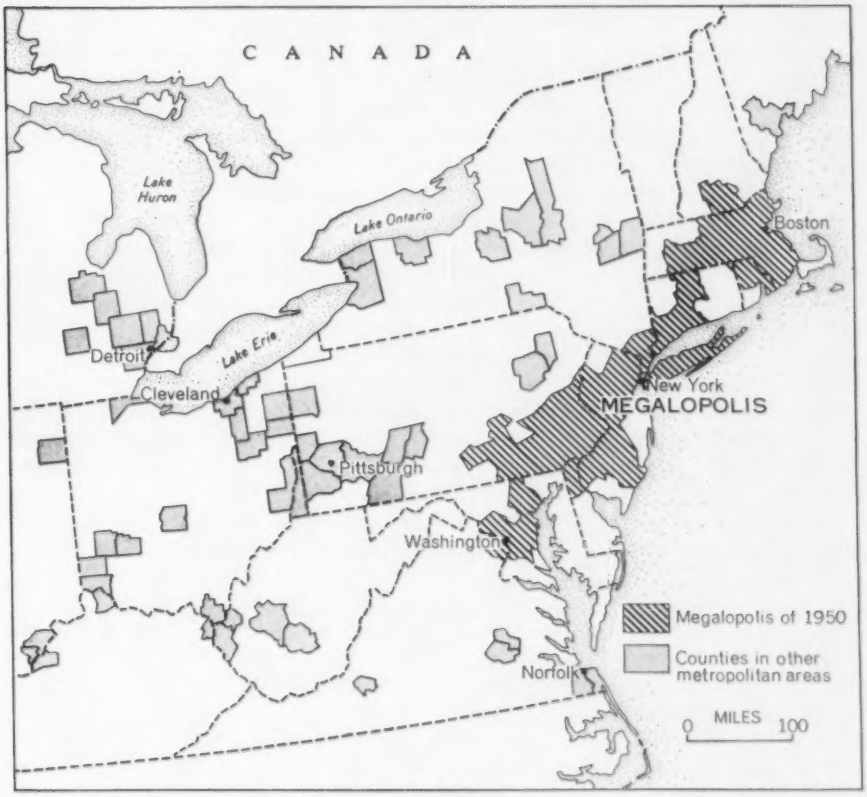

FIG. 4.

wards a little interrupted chain extends towards Pittsburgh, Pennsylvania. Between Megalopolis on one hand and the trans-Appalachian urbanized and industrialized areas, the valleys and ridges of the Appalachian Mountains cause a clearcut break. But if the Pittsburgh-Cleveland-Syracuse-Albany chain would come to be consolidated, even mountain ranges could be overcome and an enormous sort of annular megalopolitan system could arise; the St. Lawrence Seaway, if it developed into a major artery of navigation, could precipitate such a trend.

A much smaller but curiously "annular" urban system is already shaping in the Netherlands, as after the coalescence of the cities along the main seaboard axis of Holland, from Amsterdam to Rotterdam, urbanization is gaining inland, along the Rhine from Rotterdam to Arnhem, and along roads and canals from Amsterdam to Utrecht. The coalescence between Arnhem and Utrecht is on its way. In England the U-shaped chain of the metropolitan type outlined above from Manchester to Leeds has not been filled up in between these two cities along the shortest line into another annular formation because of the topographical obstacle of the Pennine range, still an empty area. This obstacle is comparable, though it is on a much

smaller scale, to the Appalachian ridges back of Megalopolis.

Other trends of megalopolitan expansion in territory could be discussed either inside the mountainous obstacle itself or northeastwards in the seaboard area. But these trends are definitely seasonal. In the past Megalopolis has in fact *emptied* the neighboring mountains, northern New England, and even to some extent the province of Québec in Canada by attracting millions of people from difficult rural areas, less rich in opportunity. Now, with the rise of the standard of living, with more people taking longer summer vacations, the cooler New England seashore or hills, the Appalachian plateaus, attract a sort of *transhumance* of city folks to summer pastures. This transhumance seems to be constantly on the increase and creates for the summer months long-range commuting problems. If the contiguous areas, where the majority of the permanent population lives from the proceeds of summer residents and tourists, were to be included in the territorial concept of Megalopolis, the limits of our area would have to be rapidly and substantially enlarged.

Urban land utilization is indeed devouring land fast, in many ways. The old habit of considering it as a minor occupant of space will soon have to be revised. Our modern civilization has found the means to grow more and more agricultural products, to raise more and more livestock, on less space; but industrial, commercial, and residential uses are constantly increasing their space requirements. Our generation is probably witnessing the beginning of a great revolution in the geography of land use. Megalopolis heralds a new era in the distribution of habitat and economic activities.

BANANAS IN ECUADOR: A NEW CHAPTER IN THE HISTORY OF TROPICAL AGRICULTURE*

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ECUADOR'S rapid rise to preeminence among the world's banana exporters has few parallels in the history of tropical agriculture. This smallest of South American republics had been an inconsequential factor in the international banana trade as recently as ten years ago. An insatiable post-war demand for the fruit, coupled with a slackening off of production in some of the older producing areas due to plant disease, hurricanes, floods, and labor unrest, created a market situation that has enabled Ecuador to challenge the traditional dominance of the Caribbean and Central American countries in the industry.

The banana fever took hold in the Guayas lowlands about 1947, stimulated by high fruit prices, cheap agricultural credit, and a vigorous road-building program. It swept northward to rain-drenched Esmeraldas province, inland to the new colonization zone around Santo Domingo, and finally to the Machala district of El Oro province on the south coast (Fig. 1). Exports, which averaged three million stems in 1945–49, had soared to 18.7 million stems by 1952 to give startled Ecuador world leadership in the banana trade for the first time. In the ensuing years Ecuador has further strengthened its hold on first place. Exports of 26 million stems in 1955[1] were almost twice those of its nearest rival, Costa Rica. Preliminary figures show that a slight decline occurred in Ecuador's shipments in 1956, but its leadership remained unchallenged.

*This article is based on field work in Ecuador during the summer of 1956 supported by the Geography Branch, Office of Naval Research.

The Changing Geography of World Banana Production

Probably no other tropical plantation crop has been so subject to the vagaries of plant disease, climate, and political and social unrest as has the banana. It has also been influenced, though in lesser degree, by the shifting tax and tariff policies of governments. The herbaceous character of the banana plant, however, permits the rapid expansion or reduction of acreage as markets or other conditions dictate. Hence, the time lag in the adjustment of production to demand is notably shorter than for the typical tropical tree crop.

The geography of export banana production is continually changing. In the past, proximity to the United States market and the high perishability of the fruit have combined to maintain the dominant position of the Central American and Caribbean countries in the

[1] Equivalent 50-pound stems as estimated by the United States Department of Agriculture, Foreign Agricultural Service. Actual exports from Ecuador in 1955, according to the Banco Central, were 23,900,000 stems. The Cámara de Agricultura de la Segunda Zona (Guayaquil) estimated 1955 exports at 24,042,658 stems.

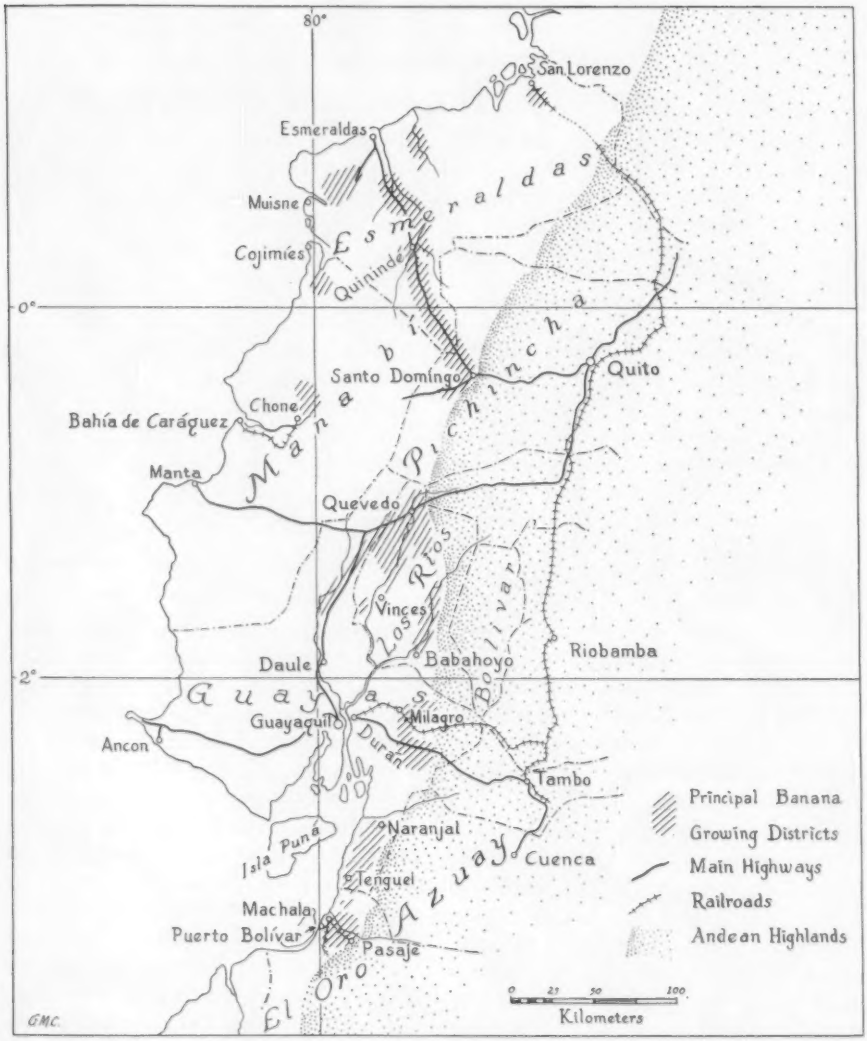

FIG. 1. The banana-growing districts of the Pacific Lowland of Ecuador. (Map drawn by Gene Christman.)

world trade. From the initiation of banana exports in the 1870's until 1926, Jamaica was the world's leading shipper; the Central American countries, Cuba, and Colombia were not far behind. Thereafter, until 1940, Honduras, Mexico, and Jamaica jointly dominated the trade. Since then, as a result of war and plant disease, the share of the world market held by Jamaica, Mexico, and Cuba has sharply declined while Costa Rica, Panama, and, after 1951, especially Ecuador, have been in the ascendancy (Table I).

The share of the world's exports coming from countries touching on

TABLE I

INTERNATIONAL BANANA TRADE, 1935–1955

Exports in 1000 stems*

		Averages	
	1955	1951–55	1935–39
Ecuador	26,150	18,902	1,920
Central America-Caribbean Area			
Costa Rica†	14,011	15,541	4,569
Panama†	12,130	8,611	9,779
Honduras†	10,929	12,503	11,723
Colombia†	9,243	7,348	7,475
Jamaica	7,627	5,251	13,042
Guatemala†	5,011	6,705	8,405
Guadaloupe	2,954	3,157	1,810
Martinique	2,284	2,435	1,336
Dominican Republic†	1,882	1,779	291
Mexico	1,632	2,151	13,103
Nicaragua	400	460	1,982
Cuba	53	42	5,358
Other	2,014	1,121	1,483
	(69,298)	(68,107)	(80,336)
Brazil	9,291	8,811	9,366
Canary Islands	8,543	7,409	5,319
Other Africa	16,717	13,698	7,156
Taiwan	1,540	1,466	5,570
Oceania	950	529	552
World Total	131,489	118,616	110,249

*Equivalent stems of 50 pounds.

†Production predominantly from large corporate plantations.

Source: U. S. Department of Agriculture, Foreign Agriculture Circulars.

the Caribbean dropped from 73 per cent in 1935–39 to 53 per cent in 1955. This loss had been entirely absorbed by Ecuador, which by the latter year accounted for 20 per cent of the world trade. The Canary Islands, mainland Africa, Brazil, Taiwan, and Oceania are the other exporting areas.

The rapid expansion of the European market has been a major feature of the world banana trade since World War II. Diversion of a portion of the already reduced Central American and Caribbean production to meet this strong European demand has facilitated the entry of Ecuadorean fruit into United States markets. Europe's 1955 consumption of 49 million stems represented an increase of 48 per cent over the 1935–39 period. Despite its rapid population growth the United States has shown no corresponding increase. In 1955 United States imports were the equivalent of 67 million 50-pound stems, only three million stems above the 1935–39 average. Per capita consumption, 22 pounds in the 1930's, is less than 17 pounds today.

THE POST-WAR BANANA BOOM IN COASTAL ECUADOR

Bananas have revolutionized the economy of the coastal lowlands of Ecuador and its commercial capital, Guayaquil (population 280,000). After exchange adjustments, bananas accounted for 42 per cent of Ecuador's export earnings in 1955, despite exceptionally high world prices and increased production of cacao and coffee, the traditional export crops. Income from fruit sales far exceeds that from cacao during the cacao boom period a half century ago. Cacao always has been a plantation crop, the profits from which have been funneled off to wealthy hacienda owners living in relative splendor in Guayaquil, Paris, or Madrid. Most of the new banana farms, on the other hand, are small holdings with from 10 to 30 acres in fruit. Foreign-owned plantations probably grow less than 15 per cent of the total exportable production.

Market demand alone did not create the post-war banana boom in Ecuador. Shipping was readily available and rates were low. Export taxes on the fruit, which had crushed at least one early venture, had been removed and a positive government policy favorable to the industry had taken their place. Moreover, there were available extensive tracts of tropical lowlands with good to excellent forest soils. In the south these are derived from recent alluvium, while north of Vinces and Babahoyo the parent material is a recent volcanic ash which mantles a low Tertiary hill land. Much of this was either govern-

TABLE II

AVERAGE MONTHLY PRECIPITATION

(In inches)

	J	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*	*Year*
Guayaquil..... (1912–1952)	9.40	12.44	12.16	7.72	2.24	.78	.12	.04	.08	.12	.18	1.49	46.77
Tenguel..... (1936–1955)	11.91	13.62	10.66	4.56	3.31	2.04	2.31	1.55	1.67	1.97	1.42	1.85	56.78
Quevedo..... (1947–1955)	22.27	15.74	17.44	15.41	4.96	1.57	3.57	.06	.71	.65	.82	3.14	86.36
Esmeraldas..... (1952–1956)	4.00	6.26	3.46	3.90	2.79	2.91	1.96	.86	.79	.43	.29	.60	28.25

Sources: Guayaquil—G. R. Wray, La cantidad de lluvia en Guayaquil durante los últimos 38 años, Bol. Cámara de Agric. de la Segunda Zona (Guayaquil), Vol. 7, No. 32, March–April, 1956, pp. 11–14. Tenguel—Cía. Bananera del Ecuador. Quevedo—Pichilingue Agricultural Experiment Station. Esmeraldas—Panagra.

Monthly averages for Esmeraldas are computed from data for January, 1952, through June, 1956; hence the annual average differs from the 34.29 inches cited in the text for the longer 1949–1955 period. The high July value for Quevedo is attributable to a single year (July, 1951, 15.27 inches).

ment land (*baldíos*) or, as on the better-drained natural levees (*bancos*) of the Río Guayas and its tributaries, semi-abandoned cacao plantations in which the leguminous shade trees had become the forest dominants. Ecuador had had no previous history of large-scale banana production so that the area was, at the start, relatively free of the pathogenic organisms that were wreaking havoc on Central American and Caribbean plantations. Furthermore, its equatorial location assured freedom from the destructive hurricanes that elsewhere periodically decimate plantings of this giant, succulent herb that is so predisposed to wind damage.

An ambitious road-building program, financed largely by the United States and the International Bank, gave the industry an important boost at a critical time. The Daule-Quevedo highway (Fig. 7) and the Durán-Tambo highway, as well as the road from the highland capital of Quito to Santo Domingo and its extensions to the navigable Río Esmeraldas at Quinindé, have opened up much new *tierra caliente* to settlement by homesteaders. In the Chone area and in El Oro a system of new access roads has supplemented existing railroad and river transport facilities in the task of moving bananas to tidewater.

Wherever conditions permit, banana farms line these new travel arteries (Fig. 8). To obtain title to *baldío* lands the settler must have put at least one-fourth of his 50-hectare (120-acre) claim into cultivation within a period of five years. For such people bananas offer a quicker return on a small capital investment than any other available cash crop. Most successful among such homesteaders are the *montuvios*, coastal mestizo folk from Manabí province and the Guayas basin. In contrast the *serranos* from the highlands have often paid dearly for their first lessons in tropical agriculture. Among the latter there has been a substantial number of Quito businessmen or government officials for whom a banana farm has been both a country home and a financial speculation, to be worked by wage labor and to be managed on week ends and vacations. There has been much disillusionment, for proper attention to weeding, the determination of the stage of maturity of the fruit, and the dovetailing of harvesting and transportation

FIG. 2. The Puerto Bolívar water front. Bananas being inspected and sacked in polyethylene for transfer to lighters.

have generally proved to require constant, year-around attention.[2]

No other crop provides the colonist a cash return from newly-cleared land with such ease. Wherever railroads, truck roads, or navigable waterways are available to move the fruit to the coast bananas make an excellent pioneer crop. The further fact that bananas are non-seasonal, bringing cash returns to the grower approximately every two weeks once production is established, has contributed enormously to his economic stability.

THE ESTABLISHMENT OF NEW PLANTINGS

The establishment of a new banana planting is a relatively simple matter. With axe and machete the forest is felled at the beginning of the dry season. Some weeks later the trash is fired unless, as may be the case in the northern zone, there is an insufficient period between rains to make this possible. In either case the rhizomes are set out in the midst of stumps and charred or decaying refuse without further preparation of the land. Weed control is thereafter the biggest problem. The first weeding is usually necessary within six weeks after planting and it must be repeated thereafter at about three-month intervals. On poorer soils, weeds often seem especially vigorous. Use of a nitrogenous fertilizer to induce more rapid growth of the banana plants may cut weeding costs as much as 50 per cent, for shade is the principal enemy of weeds.

Although clean weeding is believed to be necessary, both to conserve moisture and to insure that the forest does not repossess the plantation, the practice

[2] Carlos E. Fusseau: El problema del plátano en Santo Domingo, *Boletín Trimestral de Información Económica*, Quito, Vol. 2 (15), March-April, 1952, pp. 14–19.

FIG. 3 (left). Loaded banana barges at Puerto Bolívar are discarded U. S. Navy landing craft.

FIG. 4 (right). Esmeraldas, looking toward the interior from a coastal headland adjacent to the port. Balsa yards and mangrove swamp in foreground.

may eventually lead to serious sheet erosion, especially on sloping lands. In Jamaica there is evidence that half a century of clean weeded hillside banana farms has resulted in lowered yields and a permanent impairment of soil fertility.[3] A similar prospect faces Ecuador, but the industry is as yet much too young and heady with optimism to have given any attention to such matters. Most of the hill plantings are in the north, on the *lomas* of Los Rios and Esmeraldas and the Chone and Santo Domingo districts.

An important impetus to banana planting has been the liberal credit policy of the government. Between 1948 and 1951 loans were made to nearly 1000 settlers by the Banco de Fomento that financed the planting of some 25,000 acres of new bananas, mostly in the Esmeraldas and Santo Domingo areas.[4] When Sigatoka disease and weakened market demand resulted in defaults, the Santo Domingo branch of the bank for a time accepted fruit in payment and attempted to market it through its own outlet in Quito. Recently there has been a concern lest banana plantings be overstimulated and new credit is now but sparingly available.

FIG. 5. Banana ship loading on Río Guayas. Empty barges in foreground have brought fruit from Babahoyo and Daule.

CLIMATE OF THE BANANA DISTRICTS

A line running southeastward from Bahía de Caráquez through Guayaquil and the Canal de Jambelí to the Guayas–El Oro provincial boundary separates the arid and sub-humid portion of the Ecuador coast from the humid forested lowland to the north and east. It is in the latter zone that most of the banana farming is concentrated (Fig. 1).

Annual precipitation probably exceeds 100 inches in most of the vast expanse of rain forest that lies between the Andes and the Pacific Ocean northward from Bahía, Chone, and Quevedo. The exception is a curious coastal dry

[3] D. W. Rodriguez: "Bananas: An Outline of the Economic History of Production and Trade with Special Reference to Jamaica," Jamaica Department of Agriculture, Commodity Bulletin No. 1, Kingston, 1955, pp. 53–54.

[4] United Nations Economic Commission for Latin America (CEPAL), "El desarrollo económica del Ecuador," E/CN.12/385, 1953 (mimeo.), Vol. 2, p. 36.

FIG. 6. Esmeraldas cattle fatten on rejected bananas that drift onto beach.

belt that extends at least as far north as Emeraldas, where an average annual rainfall of only 34.29 inches was recorded at the Panagra air base in the years 1949–1955 (18.11 inches in 1955). Inland less than half a dozen miles the climate is super-humid and the vegetation is rain forest. Southward from Bahía along the coast aridity increases, reaching extremes at Manta (10.97 inches, 1945–53) and on the Santa Elena peninsula (Ancon, 7.70 inches, 1945–53).[5] Along the inner margin of the coastal lowlands precipitation also diminishes from north to south, but values are generally much higher than along the coast. At Santo Domingo rainfall is close to 120 inches and there is no dry season. Average precipitation declines to the southward as the June–November dry season, already evident at Quevedo, becomes more marked. Representative values for stations with longer records are Quevedo, 86.36 inches (1947–55); Milagro, 65.57 inches (1939–53); Tenguel, 56.78 inches (1936–55); Guayaquil, 46.77 inches (1915–52) [Table II]. South of Tenguel toward El Oro the decline is curiously abrupt. Machala has 23.10 inches and Puerto Bolívar, only three miles away, has substantially less. This is the only area in Ecuador where bananas grown for export are irrigated.[6]

Even the rainier portions of Guayas and Los Rios have well-marked dry seasons. In Central America this would rule out commercial banana production without irrigation. It does not in Ecuador. If 60 millimeters (2.4 inches) is taken as the critical monthly precipitation value,[7] this entire zone has 6–7 months of drought (May through October–November). The rains are heavily

FIG. 7. Loaded banana truck passes through one of the few remaining stands of forest along Quevedo-Daule road.

[5] For notes on the extent of this arid zone and its associated coastal fog, which at times extends north of the equator, see Ludwig Diels: "Contribuciones al conocimiento de la vegetación y de la flora del Ecuador" (transl. by Reinaldo Espinosa), Quito, Universidad Central, 1938, pp. 12–22, with reference to earlier studies by H. Eggers and Teodoro Wolf. See also Leo Alpert: "The Intertropical Convergence Zone of the Eastern Pacific Region," *Bulletin, American Meteorological Society*, Vol. 26, 1945, pp. 426–32; Vol. 27, 1946, pp. 15–29, 62–66; and "Atmospheric Cross-Sections of the Stratus Zone of the Tropical Eastern Pacific Ocean," *Transactions, American Geophysical Union*, Vol. 27, 1946, pp. 800–813.

[6] There is a substantial production of bananas, as well as plantains, in the irrigated valleys of southern and central Manabí province, but it is all for local use.

[7] *Cf.*, W. Lauer: "Humide und aride Jahreszeiten in Afrika und Südamerika und ihre Beziehung zu den Vegetationsgürteln," *Bonner Geographische Abhandlungen*, Vol. 9, 1952, pp. 15–98.

concentrated in January, February, and March. Very rarely, as in 1939, 1941, and 1953, heavy rains may fall during April and May, the apparent result of the temporary southward displacement of the cold water Humboldt Current.

Paradoxically, it is the rainiest months that are also the months of bright sun and clear skies. From mid-May to late November a low cloud deck, presumably originating from the influence of the Humboldt Current, covers the Ecuadorean lowlands. Solar insolation and transpiration are then sharply reduced. Here, for example, cacao and coffee are successfully grown without shade within two degrees of the equator and at sea level. This stratus deck seems equally persistent on the coast and over the interior banana zone. If the sun comes out at all during this season it is usually late in the afternoon. Apparently, the banana plant does not suffer from the resultant reduction of insolation and, in fact, must benefit from the reduced rate of transpiration during these "dry" months. There has been some speculation that a reduction in average temperatures, as well as increased humidity, is associated with this cloud cover and that this might account for the tendency to "open-handedness" and the somewhat unsatisfactory fruit size in some interior areas such as Quevedo and the adjacent foothills. Available temperature data are insufficient to permit judgment on this point. For most of the banana areas, average monthly temperatures appear to fall within the range of 75–79° F.; they may be less in some of the higher areas along the Andean footslope, as at Santo Domingo (elevation, 1600 feet). Nowhere in the banana zone have I found any records of absolute minimum temperatures below 55° F.

Where the dry season cloud deck rests against the lower Andean slopes, a persistent mist or drizzle, locally termed *garúa* (*llovizna*), keeps the leaves of the banana plant moist much of the day and further reduces transpiration. This phenomena appears to explain the successful production of bananas without irrigation even in years when total rainfall drops below 30 inches, as it did in 1952 and in 1954 at Tenguel. This *garúa* is particularly well developed and persistent in the Tenguel area, where as little as 80 hours of sunshine a month is recorded during the "dry" months. Despite the absence of true rains, the United Fruit Company records measurable amounts of precipitation, usually from .01 to .07 inches, on an average of three days out of four from June through November. In 1955, a near-normal year, precipitation was recorded at Tenguel on 239 days; of these 138 were in the six *garúa* months when a total of just under 10 inches of precipitation was recorded. The highest amount for any one day was .30 inch. The 20-year rainfall averages for Tenguel show no month with less than 1.42 inches, although the averages for the six driest months all fall between 1.42 and 2.20 inches (Table II). Virtually all of this precipitation apparently is from *garúa*, locally distinguished as either *garúa lente* or *garúa fuerte*. Its peculiar intensity here may be related to the fact that the Andean ranges extend furthest westward onto the Ecuadorean lowlands behind Tenguel. On Isla Puná and at Guayaquil dry-season precipitation from *garúa* is recorded only occasionally.

SIGATOKA LEAF BLIGHT AND PANAMA DISEASES

Sigatoka leaf blight, caused by the fungus *Mycosphaerella musicola*, Leach (*Cercospora musae*, Zimm.), is the most serious threat facing the Ecuador banana industry today. Its name derives

from a district in the Fiji Islands. Since its introduction into Central America in 1935, it has spread rapidly throughout the banana lands of the New World.[8] Sigatoka infestation results in a reduction of the leaf surface of the plant, causing smaller fruit size. Although bananas from Sigatoka-stricken areas may be salable in markets where size is not important, an equally serious problem is the tendency of such fruit to ripen prematurely. Even though the outer skin is green, the fruit may be ripening and the flesh yellow. Fruit in this condition mature very rapidly in transit and through the liberation of certain gases may hasten the ripening of the remainder of the shipment. On arrival in New York or Antwerp such a shipment may be a total loss. One or two such experiences may lead to the condemnation of a producing district by buyers.

Sigatoka seems to have appeared in the Esmeraldas district of Ecuador sometime prior to 1949. By 1952 it had reached epidemic proportions there and had forced the abandonment of at least one plantation. It has since ravished most of the older plantings along the river and has reached inland along the Quinindé–Santo Domingo road and northward to the Río Verde and the Río Santiago. It became serious in the Quevedo area for the first time in 1956 and by that year had been reported as far south as the Durán-Tambo highway. Southern Guayas and El Oro are as yet Sigatoka-free.

The spores are spread not only by wind currents but by the infected and dead leaves used for packing bananas being moved by truck and barge from field to shipside. Its lesser virulence and slower rate of spread in Ecuador than in Central America may be attributable to the absence of high winds and the relatively small size and dispersed distribution of banana farms. As communications improve from one district to another conditions for its spread should become increasingly favorable.

Sigatoka can be controlled, but only at considerable expense and difficulty. The major Central American producers have spent millions of dollars installing and perfecting systems for the application of copper sulfate sprays. Spraying is usually necessary every other week during the period of high humidity, less frequently during the dry season. The large number of small farms in Ecuador makes Sigatoka control particularly difficult. Moreover, the rolling hill terrain restricts the use of tractor-drawn spray rigs of the sort that have proven effective elsewhere. The Servicio Cooperativo Interamericana Agrícola and the Asociación Nacional de Bananeros del Ecuador have been putting much effort into the development of an effective and low-cost knapsack mist-blower. Experimentation with the use of helicopters is also in progress. Even under favorable conditions effective Sigatoka control has been estimated to cost as much as 5–6 sucres (30 cents U.S.) a stem, which at present prices would seem to be prohibitive. In Jamaica, where conditions may be quite different, control costs are reported to run 8–12 per cent of gross earnings, which is more within reason. Such control can pay, however, only where intensive production techniques are practiced and yields per acre are high. The Ecuador banana industry must inevitably move in this direction.

Up to now the only effective answer to Sigatoka in Ecuador has been the abandonment of infected plantings and the establishment of new ones. It

[8] Rodriguez: *op. cit.*, pp. 51–53. Clarence F. Jones and Paul C. Morrison: "The Evolution of the Banana Industry of Costa Rica," *Econ. Geogr.*, Vol. 28, 1952, pp. 1–19.

FIG. 8. Small holder's banana farm near Quevedo. House, on stilts, has characteristic sidings of split *guadua*.

takes at least two years from the date of initial infection before marketability of the fruit begins to be impaired. Frequently more time than this is required. Occasionally, seriously diseased plantings have later shown an unaccountable improvement in condition to the point that shipments have even been resumed.

Panama Disease, caused by the soil fungus *Fusarium oxysporum cubense*, E.F.S., was first observed in Guayas province in 1936. Today it is especially serious along the interior margins of the Ecuador lowlands, from El Oro to Babahoyo. The Quevedo and Esmeraldas areas are as yet free of it. Unlike Sigatoka, Panama Disease results in the death of the plant within a relatively short time after infection. Continuous water flooding for a period of several months is the only effective control. This technique has been employed in recent years in reclaiming infected plantations in Central America, including the Bocas del Toro district of Panama where the disease was first observed 60 years ago. It is only applicable on extensive tracts of level alluvium and so offers little promise for Ecuador. The recent recovery of the banana industry of Jamaica has been based on the substitution of a Panama-resistant variety, the Lacatan, for the standard Gros Michel (*guineo de seda*). However, the tender-skinned Lacatan has found acceptance only in the United Kingdom, a market that is effectively closed to non-Commonwealth producers.[9]

Lands seriously infested with Panama Disease may have to be abandoned. In 1954 and again in 1955 the United Fruit Company is said to have given up about ten per cent of its planted

[9] Ansell Hart: "The Banana in Jamaica: Export Trade," *Social and Economic Studies*, Kingston, Vol. 3, 1954, pp. 212–229.

area in Ecuador for this reason. In El Oro this is a particularly serious matter, for it involves abandonment of the irrigated lands of the Río Jubones plain in which substantial capital has been invested by the provincial government. A closer planting interval is used here in an effort to obtain maximum per acre yields before Panama Disease sets in.[10]

Bacterial Wilt or "Moko" is the other banana disease, but it is of little importance in Ecuador. It is caused by the soil pathogen, *Xanthomonas solonacearum*, E.F.S., which causes wilt in tomatoes, potatoes, and other *Solanaceae* and is probably indigenous to the Andean countries. The few cases of abandonment attributable to it have all been in Los Rios province.

PRINCIPAL BANANA-GROWING DISTRICTS

Prior to 1947 all banana exports from Ecuador had moved through the port of Guayaquil. It served both the farms along the Río Daule, Río Vinces, and Río Babahoyo, from whence came the famed cacao *de arriba* (*i.e.*, cacao from above Guayaquil), and those *abajo* (below), in southern Guayas and El Oro. Cacao plantations abandoned in the 1920's because of Witches' Broom disease, especially on the natural levees of navigable channels, frequently have been converted into banana lands here. It is especially on the rolling hill lands (*lomas*) of the upper Guayas basin, as along the new Daule-Quevedo highway, that a virtual banana monoculture has evolved in the past decade. A similar situation exists along the Durán-Tambo highway which leads eastward to the Andes from Guayaquil's opposite shore. Much of this land was unoccupied rain forest less than a decade ago. Quevedo (population 8000), a bustling hub of the banana business as well as the half-way station on the newly completed Quito-Guayaquil and Quito-Manta highways, epitomizes the new life that is being injected into a once lethargic economy. The town was founded in 1858 and had experienced economic booms supported by rubber, cacao, and balsa-wood before bananas moved in after World War II.[11] The area is still noted for its balsa and it was here that Thor Heyerdahl went to obtain the logs for his *Kon-Tiki* raft.

The upper Guayas basin, the Durán-Tambo highway zone with adjacent railroad-served lands above Milagro, and the Tenguel-Balao-Naranjal area probably shared about equally in Guayaquil's 14 million stems of bananas that were exported in 1955.[12] These represented about 58 per cent of Ecuador's banana exports.

Esmeraldas and Puerto Bolívar together account for all of the remainder. Of these two, Esmeraldas is the older. Banana shipments were initiated from this north coast port in 1947. They had reached a spectacular 4.5 million stems only five years later and 5.8 million stems in 1955. A marked decline in 1956 reflected Sigatoka damage and labor troubles.

Whereas the banana cultivators elsewhere in lowland Ecuador are either whites or mestizos, in Esmeraldas province they are Negroes. This coast, from Cojimíes northward to the Colom-

[10] For an analysis of the impact of both Sigatoka and Panama Disease upon Ecuador see Felipe Orellana Albán: "La industria bananera del Ecuador," Quito, 1952. Also, United Nations (CEPAL), *op. cit.*, Vol. 2, pp. 27–58; and "Servicio Cooperativo Interamericano de Agricultura y la Dirección Técnica de Agricultura," *Labor del SCIA*, Quito, Vol. 2, No. 1, January, 1956.

[11] Manuel Quintana M.: "Monografía y album de Los Ríos," Guayaquil, 1937, p. 225.

[12] All export figures cited for individual ports, as well as those employed in compiling Figure 9, are for actual stem counts. Thus, they do not equate with the export totals employed earlier in the text and in Table I, which were for 50-pound equivalent bunches.

FIG. 9. Nearly all of Ecuador's banana exports move northward, through the Canal, and then divide into three flows with the United States Gulf Coast, the United States Atlantic Coast, and Europe as their destinations. (Map drawn by Gene Christman.)

bian Chocó, is predominantly Negroid.[13] From the mouth of the Río Esmeraldas to Quinindé there is a continuous procession of Negro-operated banana farms, often shaded by *Hevea* rubber trees planted during the World War II rubber enthusiasm. Most Esmeraldas bananas are grown on rolling Tertiary hill lands which reach the sea as wave-cut cliffs. River alluvium here is of restricted extent, occuring chiefly in the lower estuarine portion of the valley which is either too arid or too poorly drained for bananas.

The port of Esmeraldas (Fig. 4) also

[13] Edwin N. Ferdon, Jr.: "Studies in Ecuadorean Geography," School of American Research, Santa Fe, N. M., Monograph No. 15, 1950, pp. 9–26.

serves the Santo Domingo district, which has become an area of banana monoculture since it has been linked by highway both with Quito and with the navigable Río Esmeraldas at Quinindé, 55 miles to the east. A highway, in the final stages of construction, will link Esmeraldas with Quinindé and, thus, with Santo Domingo and Quito. It, like the Quito–San Lorenzo railroad scheduled for completion in 1957, should open up further new areas for banana cultivation.

An agricultural census taken in 1952 showed the intensity of the banana fever in Santo Domingo. In that year almost two-thirds of all land under cultivation in the district was in bananas, mostly along the Quinindé road. Already the specter of overproduction and, perhaps, Sigatoka disease, was in sight. A census official advised the Banco de Fomento, whose loans had played a major role in the development of the area, to seek ways to reduce the amount of land in bananas by requiring the conversion of the older *plataneras* to rice and coffee.[14] Those in better condition, he observed, could supply the existing market demand, including such fruit as might be used for fattening livestock.

As Sigatoka damage has become severe in the older plantings of the Esmeraldas and Santo Domingo districts, shippers have increasingly been reaching southward along the coast for their bananas, especially to the coastal hills behind Muisne and Cojimíes and even to the Chone district of Manabí province. The last is connected to tidewater at Bahía both by the navigable Río Chone and a narrow-gauge railroad.

Puerto Bolívar, El Oro's new banana port hacked out of the mangrove bordering the Canal de Jambelí (Fig. 2), has been shipping fruit only since 1949. In the first half of 1956 it was shipping at the rate of six million stems a year, well ahead of Esmeraldas. Shipments in 1955 had been 4.8 million stems. In the arid Machala-Pasaje region, where giant cacti and mesquite stand side by side with neatly laid-out, rectilinear banana farms, a provincially-financed irrigation system, together with a small but adequate road net focusing on Puerto Bolívar, has provided an important impulse to recent new planting.

CORPORATE GROWERS AND SHIPPERS

In Ecuador, where small holders dominate the banana industry, the United Fruit Company has played a much less conspicuous role than it has in Central America and the Caribbean. Through its subsidiary, Cía. Bananera del Ecuador, it accounts for no more than one-fifth of the country's banana exports.[15] Scarcely six per cent of the company's total planted acreage in the New World tropics is to be found here. Nevertheless, its Tenguel property is one of the largest fruit farms in Ecuador and undoubtedly the most efficiently operated one. This former cacao hacienda of 96,000 acres was acquired in 1933, along with a second property in the Guayas basin. About 24,000 acres are considered suitable for bananas; one-third of this has actually been planted. The company employs 2100 persons at Tenguel and supports a community of 7100 population.

Only one stem of bananas out of every three that United Fruit exports from Ecuador is grown on its own lands. The remainder are purchased on the open market from small growers. Efforts to picture the United States concern as a soulless monopoly that threatens the country's economy have fallen

[14] Fusseau, *op. cit.*

[15] *El Comercio* (Quito), May 8, 1956.

far from the mark. Initially, United Fruit played an important role in opening up the United States market to Ecuador bananas. More recently the improved production and fruit-handling techniques employed at Tenguel have provided an important stimulus to independent growers to improve the quality of their fruit. It has not gone unnoticed by them that the average weight of a stem of bananas from Tenguel, where fertilization is standard practice, is close to 90 pounds. The average is 75 pounds for most of the rest of the country and only 55 pounds for Esmeraldas.

The other large-scale operations are neither so large nor so well managed as those of the United Fruit Company. There are two or three foreign-owned plantations immediately north of Tenguel, at Balao Chico and Naranjal, one of which is owned by Chilean interests. The Swedish-owned and operated Cía. Frutera de Astral, the major shipper from Esmeraldas, operates four farms along the river between Esmeraldas and Quinindé. These normally supply a substantial share of the 45,000 stems shipped weekly by this company, which has suffered heavy recent losses both from strikes and from Sigatoka disease. The Standard Fruit and Steamship Company of New Orleans, the other major United States exporter, purchases all of its fruit on the open market, chiefly in El Oro and Guayas. Other smaller export firms are controlled by German, Belgian, Swedish and Chilean interests. In addition there are several local merchants who from time to time consign a shipload of bananas to a European or southern United States port as a sideline to other activities.

Exporters normally obtain their fruit through brokers or middlemen. Each broker has his established grower contacts as well as his traditional connections with exporters at Guayaquil, Puerto Bolívar, or Esmeraldas. As brokers absorb the freight cost from farm to shipside, prices received by growers vary according to their location. Those in the Quevedo district, for instance, may receive 4–6 sucres (20–30 cents, U.S.) more per stem during the rainy season, when fruit moves on barges or balsas directly to Guayaquil, than during the season of slack water when it must be trucked to Daule and there transferred to barges for forwarding to Guayaquil. As the fruit is inspected at the final transfer point each stem is covered with a polyethylene bag provided by the exporter to retard the rate of ripening and reduce bruising. Rejections normally average 10–20 per cent, but when supply is outrunning demand the figure may be much higher. In general, only fruit with nine or more hands per stem is acceptable to exporters. In 1956 the only eight-hand fruit being shipped was from Esmeraldas, where Sigatoka damage had been particularly severe.

Most of Ecuador's bananas are from small and scattered farms. Long hauls and numerous transfers of the fruit are often necessary. Some bananas may be handled four or five times as they move from muleback to truck to barge to refrigerator hold. Quality inevitably suffers. Slight bruises, not visible on the green shipping banana, become conspicuous black scars as the fruit yellows and may result in sharp price reductions on foreign wholesale markets. Fine volcanic dust from the recently active Andean volcanoes of El Reventador and Sangay sometimes settles on the fruit; on handling, it may produce scratches that can result in market rejection. Much attention is currently being given to the problem of handling. It has become the custom to wrap each bunch of fruit in a protective bed of old

banana stalks and leaves for its journey to port. Where the bananas have been subject to ash falls they are dusted or washed prior to being sacked in polyethylene.

In 1956 farmers had been receiving the equivalent of $1.00–$1.20 (U.S.) per stem of bananas. The declared F.O.B export values ranged from $1.80 (Esmeraldas) to $2.65 (Guayaquil). Banana exporters were required to convert the first $1.50 on each stem at the official rate of 15:1; the remainder could be converted at the free rate of 18.50:1. To aid the depressed Esmeraldas industry the National Monetary Board permits conversion of everything received in excess of $1.00 a stem for exports from that port at the more lucrative free rate. Exports to European markets also receive preferentially favorable exchange treatment.

There is no wharf or pier at any of Ecuador's banana ports that will accommodate ocean-going ships. All bananas must be loaded from lighters by stevedores. Most of the fruit moves to foreign markets in especially designed banana boats, either those owned and operated by the two big United States companies or smaller, chartered vessels (Fig. 5). There are also three common carrier lines that handle bananas. The most important of these, W. R. Grace & Company, has six ships a month to New York City, each with space for 1000 tons or about 20,000 stems of bananas in its refrigerated holds. As the maximum depth in the river at Guayaquil is only 23½ feet and the ships are already well loaded upon their arrival from the south, this company loads off Isla Puná rather than at Guayaquil. The projected development of the Salado estuary behind Guayaquil into a silt-free, deep-water port would obviate this necessity.

FUTURE OF BANANAS IN ECUADOR

There is widespread recognition in Ecuador that the banana bonanza of the past decade has been the product of a temporary and uniquely favorable set of circumstances. The permanent retention of this newly-won position will not be easy. In a more competitive market it is feared that Ecuadorean fruit may be unable to compete with that of the better situated Caribbean and Central American producers. As delivered on world markets Ecuador's bananas are frequently of inferior appearance to those of other areas. They move most readily when there is a shortage in consuming markets, as was the case in 1954 and 1955. Ecuador must improve fruit quality, it has been pointed out, or face the prospect of being a residual supplier to the world market.[16] In the latter case its expanding production could be sold only in shortage periods. What happens in the future will depend in large part on the nation's success in combatting Sigatoka and in improving methods of fruit handling.

It is anticipated that Europe will take an increasing share of Ecuador's banana exports. Not only are small fruit often acceptable there, but marketing channels in Europe are more open and competitive than in the United States. The fact that most of the new banana acreage planted since 1954 in Central America has been planted by the two big integrated United States fruit companies does not improve market prospects for Ecuadorean bananas. In 1955 some 27 per cent of Ecuador's exports went to European markets, chiefly Germany, Belgium, and Sweden.[17] Another five per cent went to Chile and the

[16] Chase Manhattan Bank, *Latin-American Business Highlights*, December 1956, pp. 17–18.
[17] Banco Central del Ecuador, Departamento de Investigaciones Econômica (Quito).

remaining 68 per cent to the United States (Fig. 9). Two years earlier the United States had taken 80 per cent of Ecuador's exports. The pre-war Peruvian market has been lost as new production in Peru's northern desert valleys has made that country self-sufficient.

Although one banana out of every three consumed in the United States is from Ecuador, no Ecuadorean fruit moves through United States West Coast ports. In 1955 New Orleans was the principal market, receiving 7.2 million stems. New York was second, with 3.4 million stems, followed by Charleston, Tampa, Baltimore, and Galveston. In that year, Puerto Bolívar shipped almost exclusively to New Orleans; Esmeraldas to New Orleans and Tampa; Guayaquil to New York, Baltimore, Charleston, New Orleans, and the European ports.

Natural conditions for banana cultivation appear to be excellent in Ecuador and there are extensive tracts of unused forest that are considered potential agricultural lands. It has been calculated that existing truck roads, railroads, and navigable waterways in that part of the Ecuadorean lowlands climatically suitable for banana growing presently serve one million acres.[18] This assumes one kilometer to be the maximum distance from such travel arteries that bananas can be economically transported, either on men's shoulders or by mule. Perhaps one-half of this land is presently cleared and is in one use or another. So long as prices remain at a profitable level and the disease problem is in hand, new access roads will continue to be built to open additional areas to banana colonists.

Rationalization and intensification of present production rather than further expansion is the course counseled by most responsible observers. Better cultivation techniques, irrigation, fertilization, and a continuing readjustment of production to the best soils, all necessitated by the high cost of fighting Sigatoka, should lead to further increases in yields per acre. Bananas, too, are increasingly being used as a temporary nurse crop for cacao and coffee and so are promoting, it is hoped, a more permanent and diversified form of land use. Banana monoculture has its undesirable sociological and economic aspects, but on the coast of Ecuador these seem to be balanced, at least temporarily, by its role in stimulating the opening up of new lands for settlement. Through bananas the country has been awakened to the unrealized potentialities of the alluvial and volcanic soils of its coastal lowlands, which are perhaps as promising as any to be found within the rainy tropics of the New World.

[18] Jack Bermeo: "Posibilidades de aumentar la producción y exportacion del banano del Ecuador," *Boletín Trimestral de Información Económica*, Quito, Vol. 3 (20–21), December, 1953, pp. 3–9.

PUTTING THE "ECONOMIC" INTO ECONOMIC GEOGRAPHY

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ONE of the paradoxes of contemporary geography is the disparity between the number of substantive contributions to economic geography and the conceptual progress of this branch. Anglo-Saxon geographers favor individuality rather than scholastic conformity, so that methodological aspects have tended to be overshadowed by the volume of case studies. True, a simple methodology can be traced in these studies, as shown in the progress from the physical elements of environment to social and economic features and, finally, to areal synthesis. This has both supported and, in turn, has been aided by, the importance of the "region" in geographical literature. It has become evident, however, that without a greater sophistication than is current, this methodology fails to meet the needs of economic geography. The satisfaction of these needs—greater rigor in defining concepts, precision in measurement, and applicability of conclusions—may eventually lead to those elusive "principles of economic geography."

The Problem

Two important factors are responsible for the *malaise* in economic geography. One is the need for a physical geography which has a special relevance for economic activity. This does not imply that all physical geography should be studied with this in view. It does mean, however, that unless studies typified by Curry's application of the Thornthwaite climatic system[1] to the scheduling of farm work are continued, then the division between physical and human geography will grow larger, and develop as a gap between geographers rather than supplying distinctive tools that should be in the possession of every geographer.

It is with the other factor, however, that this paper is concerned. This is the necessity of a knowledge of economics in general and of certain branches in particular. Given the present nature of physical geography, the difficulties of establishing spatial correlations and relationships, economic geography can no longer be regarded as the study of the physical environment of economic activities, or of the influence of that environment on these activities. It has become a borderline subject which requires the contributions of both geographers and economists, and whose progress will largely depend on people trained in both fields. It has broken away from the status of an introductory course in geography tailored to the supposed needs of commerce students. It has stepped out of the confines of the

[1] Leslie Curry: "Climate and Economic Life," *Geogr. Rev.*, Vol. 42, 1952, pp. 367–383.

lecture room into the world of applied social sciences, and it is here that the need for principles of demonstrated validity is evident.

PRESENT POSITION OF ECONOMIC GEOGRAPHY

A newcomer to the study of geography would be intrigued to discover that the branch of the discipline which enjoyed the greatest popularity rested on such an uncertain methodology. Using Brigham's nine-fold division of geography, John K. Wright found that of the 220 papers at the annual gatherings of the Association of American Geographers between 1904 and 1909, only 6 per cent dealt with economic geography. Of the 207 papers listed for the annual meetings 1951–1954, economic geography accounted for 42 per cent.[2] Dealing with geographical periodical literature in Canada, Pierre Dagenais estimated that 42 per cent of the 1328 contributions in 1940–1950 were in the economic section of geography, including many by non-geographers.[3]

The importance of economic geography that such data suggest is further supported by the views of eminent geographers on the position of the branch within the main discipline. Barrows assigned the major role to economic geography in his three-fold division of systematic geography.[4] Hartshorne believed that "Geographers are justified in regarding human geography very largely in terms of economic geography."[5] Sauer held a similar view of the importance of economic geography in determining his "Culture Areas,"[6] and Wooldridge and East, despite certain misgivings, thought that "the pattern of human geography will reflect in large and probably overwhelming degree the nature of prevailing economic activity."[7]

The field of economic geography has been subdivided into a number of specialties, and geographies of agriculture, manufacturing, transportation, marketing, and recreation have been produced.[8] To these may be added certain aspects of urban geography, such as the classification of communities by their economic structures. Some of these specialties enjoy a greater popularity than others, with considerable work having been done on agriculture, less on manufacturing and transportation, and little on marketing and recreation. Tertiary activities, an important occupational segment in the more industrialized countries, appear to be on the outer fringes of geographical research.

Those who seek a body of principles derived from past research for the guidance of future inquiries, will be disappointed. Unlike economics, where the premium has been placed on generalization and principle, economic geography has been short on theory and long on facts. Compared with other branches of geography, there are no equivalents to Davis' geomorphological cycle, Köppen's climatological classification, or to the works of Brunhes in human geography and of the French

[2] John K. Wright: "An Informal Revision of an Informal Talk Before the New York Metropolitan Division of the A.A.G., March 19, 1954," *Prof. Geogr.*, Vol. 6, November, 1954, pp. 6–11.

[3] Pierre Dagenais: "Status and Tendencies of Geography in Canada," *Canadian Geogr.*, No. 3, 1953, pp. 1–16.

[4] Harlan H. Barrows: "Geography as Human Ecology," *Annals Assn. of Amer. Geogs.*, Vol. 13, 1923, p. 7.

[5] Richard Hartshorne, *The Nature of Geography*, Lancaster, Pa., 1939 (1951 Reprint), p. 400.

[6] Carl Sauer: "Cultural Geography," in *Encyclopaedia of the Social Sciences*, Vol. 6, p. 623.

[7] S. W. Wooldridge and W. Gordon East: *The Spirit and Purpose of Geography*, Hutchinson's University Library, London, 1951, p. 117.

[8] The developing scope of economic geography can be seen from contributions to Preston E. James and Clarence F. Jones, *American Geography: Inventory and Prospect*, Syracuse, N. Y., 1954.

School in regional study. This does not decry the high standards achieved in monographic work at certain universities, and in some of the many textbooks in economic geography, but the net result has been unfortunate. A reading of H. H. McCarty's thoughtful article on "An Approach to a Theory of Economic Geography,"[9] shows how limited real progress has been. It pleaded the elementary necessity of a disciplined approach as a basis for a theory of economic geography. Stephen Jones in his popular essay on "Geographical Thought in the United States,"[10] made only brief specific reference to economic geography "under the head of business in progress." Referring to the increased use of economic theories and statistical methods, he held this was in its infancy and that "the infant may turn out to be raised by economists of geographical mind rather than by men who call themselves professional geographers."[11] This, 72 years after "economic geography" was first designated as a branch of geography,[12] 32 years after Barrows gave pride of place to economic geography in his essay on "Geography as Human Ecology,"[13] and at a time when writings in economic geography dominate the field of human geography. What happened in the interim? What will happen in the future?

There is a general belief that the geographer's main contribution lies in establishing the physical stage for the other social sciences, and this has been the theme of several college textbooks.[14] Towards the deterministic extreme, the views approach that of Rudmose Brown, who wrote "Economic geography is that aspect of the subject which deals with the influence of the environment, inorganic and organic, on the economic activities of man,"[15] and kept close to this view throughout his text. It is an old theme in economic geography, having originated with Götz, and is with us today.[16] Though old-fashioned determinism is generally unpopular in contemporary geographic circles, the possibility of reformulations of the older dogmas cannot be discounted. A. F. Martin[17] has made a provocative assault on possibilism, and one aspect of his essay, that which stresses the need for a clearer particularization of environmental controls, is well chosen.

Perhaps more attuned to contemporary practice is the belief of Zimmermann, that the economic geographer worked his way upward from an understanding of physical realities and the physical basis to the cultural superstructure. The economist, who dealt with a section of the cultural superstructure, probed downward toward the physical foundation.[18] A somewhat similar view that economic geography must begin with the physical environment was advanced by Lord Stamp, but was subordinated to his general interest in the possible nature of geographic "laws."[19] Belief in the "background" function of economic geography and that its practitioners should serve as maids-of-all-work, has handicapped the search for the sharper analytical tools required by those in "applied economic

[9] *Econ. Geog.*, Vol. 30, 1954, pp. 95–101.
[10] *Perspectives*, 1955, No. 12, pp. 59–76.
[11] *Ibid.*, pp. 75–76.
[12] Wooldridge and East, *op. cit.*, p. 104.
[13] Barrows, *op. cit.*, p. 104.
[14] For a review of college textbooks on economic geography, see Jan O. M. Broek, "Discourse on Economic Geography," *Geogr. Rev.*, Vol. 31, 1941, pp. 661–674.
[15] R. N. Rudmose Brown: *The Principles of Economic Geography* (Fifth edit.), London, 1946, p. ix.
[16] Wooldridge and East, *op. cit.*, p. 104.
[17] A. F. Martin; "The Necessity for Determinism," *Trans. and Papers of Inst. of Brit. Geogrs.*, 1951, pp. 1–13.
[18] Erich W. Zimmermann: *World Resources and Industries*. (Rev. edit.), New York, 1951. p. xi.
[19] J. C. Stamp: "Geography and Economic Theory," *Geography*, Vol. 22, 1937, pp. 1–13.

geography." Geographers whose basic training has been largely in the physical and natural sciences, and whose application of this training has been on the broad canvas of regional studies, frequently lack adequate training in economics.[20] V. C. Finch's opinion that, on the whole "the body of principle or theory peculiar to economic geography is not well developed . . . "[21] holds today as it did in 1944.

SUGGESTED SOLUTIONS

Proposals have been made to overcome these problems. Two of these originate from the views that geographers should keep pace with developments in general economics, and that a prescribed division of labor between economic geographers and economists would assist in the progress of economic geography. The first is represented by Charles A. Fisher's essay on "Economic Geography in a Changing World."[22] Drawing parallels between changes in economics and those in economic geography, Fisher recommended that geographers keep abreast of developments in technology, prevalent political trends, and the national orientation of economics. He urged the amalgamation of economic and political geography. This new political geography, however, was not elaborated, but by inference one would suspect that it was human geography geared to some type of national resource inventory. In any event, it is doubtful whether any strong case could be made for a close parallelism in the developments of economics and economic geography, particularly at the analytical level.

Edward Ullman,[23] and to a limited extent, Harrison Church,[24] have endeavored to delineate the field of economic geography on a topical basis. Ullman considered "various aspects of agriculture, mining, and other production; industrial location and development; transport routes and flows; markets; and rural and urban settlements,"[25] as topics appropriate for economic geographers, whereas, he says, economists have found price movements, fiscal policy, income, and similar variables more congenial. This division does not really do full justice to the contributions that economists have made to industrial location and marketing. It neglects to point out that space and spatial relationships thread all economic activities, a feature also neglected by all but a handful of economists, and which may partly explain why economists have not been noted for their contributions to methodology in economic geography.

A WAY OF PROGRESS

The wide range of topics covered by economic geography makes dogmatism dangerous, but significant progress in economic geography will depend on ability to satisfy certain basic requirements of a consistent methodology. An uncontroversial definition of economic geography would define it as the study of the spatial variation of economic life. This study would have to include as a minimum three important stages—the *selection*, the *measurement*, and the *establishment of relationships* between data, presumably over some time period.

The selection of data is partly given

[20] Karl Sapper: "Economic Geography," in *Encyclopaedia of the Social Sciences*, Vol. 6, p. 627.

[21] V. C. Finch: "Training for Research in Economic Geography," *Annals Assn. of Amer. Geogs.*, Vol. 34, 1944, p. 212.

[22] *Trans. and Papers of Inst. of Brit. Geogrs.*, 1948, pp. 69–85.

[23] Edward L. Ullman: "Human Geography and Area Research," *Annals Assn. of Amer. Geogs.*, Vol. 43, 1953, pp. 54–66.

[24] R. J. Harrison Church: "The Case for Colonial Geography," *Trans. and Papers of Inst. of Brit. Geogrs.*, 1948, pp. 17–25.

[25] Ullman, *op. cit.*, p. 54.

by the topic of the problem and partly by the insight of the investigator into the most important factors relating to his topic. Of all branches of economic geography, those most closely related to the immediate physical environment, such as agricultural geography, appear to have been most successfully dealt with in economic geography. Natural factors of the environment tend to limit rather rigorously possible varieties of production in agriculture, though the actual selection among these varieties is largely a matter of human choice. The ties of manufacturing with natural environment are far less direct, and while it is misleading to think that all manufacturing location is determined within a narrow range by "economic principles," whatever universal reason there is to location approximates a logic of cost accessibility—cost accessibility to supplies, markets, labor, transportation, research, and competitors. Manufacturing, therefore, deals with data largely outside the traditional emphasis in geography.

The measurement of data is a very important aspect of geographical research. Difficulties in measuring physical conditions are familiar to all geographers, but no less difficult are the measurements of non-physical data. In manufacturing geography, how does one measure quantity or magnitude, intensity, and specialization, and how can one use existing statistics to obtain "watersheds" of manufacturing employment for major centers? In working recently on these problems, indexes developed from such data as manufacturing value added, employment, and labor force were used,[26] and those interested in a more accessible recent contribution to this problem may refer to John H. Thompson's article on "A New Method for Measuring Manufacturing."[27]

Perhaps farther from solution is the problem of an appropriate areal unit on which to base statistical information. The manufacturing unit approaches a one-point utilization of space, so that the familiar areal gradients of agricultural geography cannot be easily translated into the realm of manufacturing, which is characterized by a highly discontinuous distribution. How *does* one define the "manufacturing area?" Is it the sales area, labor force area, supply area? These are examples of issues which are constantly faced in economic geography, apart from the more familiar problems of statistical analysis and comparability of data over time.

Of the three basic steps of selection, measurement, and establishment of relationships of data, the first two are usually attained in one fashion or another by most studies in economic geography. Limitations of available information result in a certain amount of compromise, but the major elements are visible. The third and most significant step, the establishment of spatial relationships between data, is, however, very elusive. This is particularly unfortunate, as significant progress in establishing a body of principles in economic geography depends upon the repeated recording of relationships between comparable bodies of data. While some of the difficulty is directly related to the problems of selection and measurement, a major problem is raised by the concept of spatial relationship.

One aspect of spatial correlations, the regional concept, is quite familiar to geographers. Spatial correlations, how-

[26] Maurice Bernard Ballabon: *Areal Differentiation of the Manufacturing Belt in Central Canada*, unpublished doctoral thesis, McGill University, Montreal, 1955.

[27] *Annals Assn. Amer. Geogrs.*, Vol. 45, 1955, pp. 416–436.

ever, include more than areal coincidence of data. For geographers, space has two major connotations—*distance* and *area*. As J. W. Watson pointed out in his recent inaugural address as Chairman of the Department of Geography at Edinburgh, geography is concerned with many kinds of distances.[28] Of those mentioned, he singled out one in particular for emphasis. This he termed *cost* distance, and claimed that economic and social factors have created a new geography, called *cost* geography. A parallel to this new geography may be found in a field of economics which is now undergoing a revival. This is location theory.

Location theory is, of course, concerned with area as well as distance, but area is here regarded as a direct extension of distance, as can be clearly seen in Von Thünen's agricultural zones[29] and Olaf Lindberg's study of the Swedish paper industry.[30] The major theoretical workers in the field, Alfred Weber,[31] August Lösch,[32] William Dean, Jr.,[33] Edgar Hoover,[34] and Sargant Florence,[35] who developed empirical measures of location, were, or are, all economists. Moreover, while geographers have contributed to location theory, either through developing their own models or commenting on the theorizing of others,[36] the view that further developments in this theory, or group of theories, must depend on economists, seems to have been accepted.[37] Although it may be an exaggeration to claim that "contemporary American industrial geography is dominated by the problem of location,"[38] this dependency is a major concession.

It is yet too early to decide whether the study of "social physics" will yield any alternative. It certainly appears to compare favorably with the devious maze of economics, but general acceptance in geographical methodology must be carefully considered. The ecological basis of much of contemporary sociology is being questioned,[39] and at least one mathematical device used in these studies, the double logarithmic graph, is of questionable value in its context. There is a danger that geographers may

[28] J. W. Watson: "Geography—A Discipline in Distance," *Scot. Geogr. Mag.*, Vol. 71, April, 1955, pp. 1–13.

[29] See, for example, Erich Otremba, Allegemeine Agrar-und Industriegeographie, Vol. 3, p. 90, of R. Lütgens, edit., *Erde und Weltwirtschaft;* Stuttgart: Franckhsche Verlagshandlung, 1953.

[30] Olaf Lindberg: "An Economic-Geographical Study of the Swedish Paper Industry," *Geografiska Annaler*, Vol. 35, 1953, pp. 28–40.

[31] Alfred Weber: *Theory of Industrial Location*, English edit. by Carl J. Friedrich, Chicago, 1929.

[32] August Lösch: *The Economics of Location*, English edit. from the second revised German edit. by William H. Woglom, 1954.

[33] William H. Dean, Jr.: *The Theory of the Geographic Location of Economic Activities, with Special Reference to Historical Change*, unpublished Doctoral thesis, Harvard University, Boston, 1938.

[34] Edgar M. Hoover: *Location Theory and the Shoe and Leather Industries*, Cambridge, Mass., 1937; and *The Location of Economic Activity*, New York, 1948.

[35] P. Sargant Florence: *Investment, Location, and Size of Plant*, Cambridge, England, 1948; and *The Logic of British and American Industry*, London, 1953.

[36] See, for example, S. Beaver, "The Localization of Industry," *Geography*, Vol. 20, 1935, pp. 190–194; Arthur H. Doerr, "A Quantitative Analysis of the Locational Factors in the Integrated and Semi-Integrated Iron and Steel Industry of the United States and Canada," *Jour. of Geogr.*, Vol. 53, 1954, pp. 393–402; Francis E. Elliott, "Locational Factors Affecting Industrial Plants," *Econ. Geog.*, Vol. 24, 1948, pp. 283–285; Richard Hartshorne, "Location as a Factor in Geography," *Annals Assn. Amer. Geogrs.*, Vol. 17, 1927, pp. 92–99, and "Location Factors in the Iron and Steel Industry," *Econ. Geog.*, Vol. 4, 1928, pp. 241–252; H. H. McCarty, "A Functional Analysis of Population Distribution," *Geogr. Rev.*, Vol. 32, 1942, pp. 282–293; George T. Renner, "Geography of Industrial Location," *Econ. Geog.*, Vol. 23, 1947, pp. 167–189.

[37] Richard Hartshorne: *The Nature of Geography, op. cit.*, pp. 419–420; and H. H. McCarty: *The Geographic Basis of American Economic Life*, New York, 1940, p. 497.

[38] Otremba, *op. cit.*, p. 206.

[39] William H. Form: "The Place of Social Structure in the Determination of Land Use; Some Implications for the Theory of Urban Ecology," *Social Forces*, Vol. 32, 1954, pp. 317–323.

be led to accept a mathematical determinism in relationships where many once postulated environmental determinism.

If, as yet, locational theory is still incomplete, despite the efforts of Walter Isard and other economists,[40] it has done valuable service in attempting to give order to what geographers are too likely to regard as fortuitous economic circumstances, and precision to the ambiguity with which economic geographers use such terms as *market orientation*, *optimum conditions*, and *supply* and *demand* in their spatial contexts.

Of the concepts of economic areas, Christaller's hierarchy based on the tributary areas of service centers is perhaps the most familiar, and August Lösch has a similar if more sophisticated version of Christaller's work in his study of economic regions, to which his location theory led. Philip Neff[41] and Rutledge Vining[42] were led to consider the character of economic areas through their interest in business cycle theory, and Vining has tended to identify it with the market area of the "resident industry" that naturally crystallizes around a locational core of primary industry.[43] Some will note the similarity to the basic-nonbasic occupational studies of John Alexander.[44] In contrast to the "economic dynamic" models of Vining, there are the more conservative studies of Donald Bogue[45] and the Canadian Department of Defence Production[46] catering to the practical needs of developing area units for the utilization of economic statistics. As with location theory, the study of economic areas has led to no conclusive formulation, but contributions to the delimitation of actual areas have been made, and certain indicators of spatial relations have been discovered.

These developments in locational theory and the study of economic areas may render valuable service in the successful prosecution of the culminating stage of research in economic geography adding new dimensions and direction to our work. We are, perhaps, fortunate in finding people in another discipline working along such complementary lines. Their work, however, must be translated into the current studies of the wider field of economic geography, and, as economists so far have appeared reluctant to do this work, geographers must acquire the basic tools and concepts of economists to gain this prize. This has been urged before, but the rewards for the mastery of these tools and concepts have never been so great in the past as they are today.

[40] Walter Isard: "The General Theory of Location and the Space Economy," *Quarterly Journ. of Econs.*, Vol. 63, 1949, pp. 476–506, and "Distance Inputs and the Space Economy," *Quarterly Journ. of Econs.*, Vol. 64, 1951, pp. 373–399; Walter Isard and Merton J. Peck: "Location Theory and International and Interregional Trade Theory," *Quarterly Journ. of Econs.*, Vol. 68, 1954, pp. 97–115; Melvin I. Greenhut: "Integrating the Leading Theories of Plant Location," *Southern Econ. Journ.*, Vol. 18, 1952, pp. 526–538.

[41] Philip Neff: "Interregional Cyclical Differentials: Causes, Measurement and Significance," *Amer. Econ. Rev.*, Vol. 39, May, 1949, pp. 105–119; Philip Neff and Annette Weifenbach: *Business Cycles in Selected Industrial Areas*, University of California Press, Berkeley, California, 1949.

[42] For his more recent and comprehensive work, see Rutledge Vining, "A Description of Certain Spatial Aspects of an Economic System," *Economic Development and Cultural Change*, Vol. 3, No. 2, January, 1955, pp. 147–195.

[43] Rutledge Vining: "The Region as a Concept in Business Cycle Analysis," *Econometrica*, Vol. 14, July, 1946, p. 206.

[44] John W. Alexander: "The Basic-Nonbasic Concept of Urban Economic Functions," *Econ. Geog.*, Vol. 30, 1954, pp. 246–261.

[45] Donald J. Bogue: *State Economic Areas*, Washington, D.C., 1951.

[46] Canada Dept. of Defence Production, *Economic Zoning of Canada and Department of Defence Production Geographic Code*, Departmental Report, Ottawa, 1953, mimeo.; and *Economic-Administrative Zoning of Canada*, Departmental Report, Ottawa, 1954, mimeo.

URBAN AGRICULTURE IN SOUTHERN JAPAN

John H. Thompson

Dr. Thompson, Associate Professor of Geography at Syracuse University, carried on the field work for the study presented here during a Fulbright-supported year in Japan.

THE great cities of Japan are spreading rapidly over the agricultural land around them. Concurrently the needed amount of food is increasing. The growing demand in the cities, particularly for fresh vegetables, has supported the development of a distinctive type of extremely intensive agriculture within the general framework of paddy rice cultivation. Because of its close economic and geographic tie with cities this type of agriculture is referred to here as urban agriculture.

In southern Japan where winters are mild several succeeding crops of vegetables are often planted instead of the usual winter grain crop, or a single vegetable crop may be squeezed in between the rice harvest and the late fall sowing of winter grains. Some vegetables even compete with rice in summer. The land harvested approximates three times the area of cultivated land and production per unit area may be twice as high as in other districts where ordinary double cropping of paddy land predominates.

The purpose of this paper is to present a case study of urban agriculture in southern Japan. The principal focus is on land use around the year, and on patterns reflected in farm and crop maps.

The Case Study Area and Its Setting

A small area on the Osaka Plain was chosen for detailed examination. It contains 33 acres of cultivated land and lies half way between Osaka and Kobe, about 11 miles from the center of each city. Figure 1 shows that the built-up area of the Osaka-Kobe urban complex, including the cities of Nishinomiya and Amagasaki, has extended across the Osaka Plain leaving little land for crops. The 33-acre area is an intensively used cultivated remnant almost entirely surrounded by suburban dwellings. It is similar in character and use not only to much of the agricultural land around Osaka and Kobe, but to that around Nagoya, Kyoto, Hiroshima, Shimonoseki, and other large cities of southern Japan.

The land is essentially level, draining gradually southwestward toward Osaka Bay. The alluvial soils are friable loamy sands and fine sandy loams.[1] Heavy applications of animal manure and night soil, together with smaller quantities of commercial fertilizers enable these soils to be kept in almost constant production. The growing season is 225 days.

This area was first cultivated about the beginning of 8th century,[2] and probably has been used ever since. Rectangular property and field patterns reflect the old Handen influence from

[1] Eugene P. Whiteside: *Reconnaissance Soil Survey of Japan, Kyoto Area*, General Headquarters Supreme Commander for the Allied Powers, Natural Resources Section, Report 110-C, 1950, p. 22.

[2] Hisao Watanabe: *Koto Mura*, Katsuragi Shoten, Osaka, 1951, p. 35.

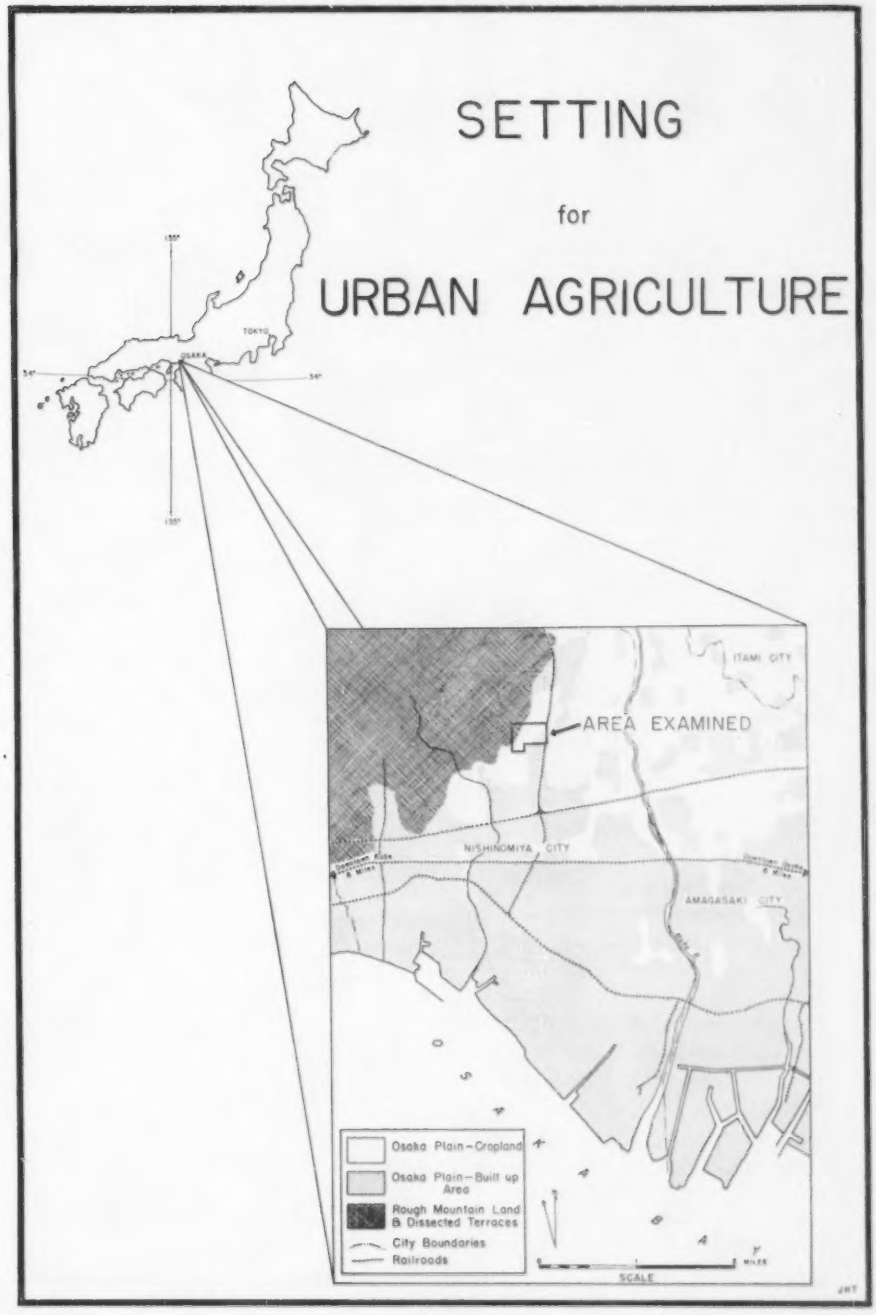
SETTING
for
URBAN AGRICULTURE
TOKYO
OSAKA
ITAMI CITY
AREA EXAMINED
NISHINOMIYA CITY
AMAGASAKI CITY
Osaka Plain – Cropland
Osaka Plain – Built up Area
Rough Mountain Land & Dissected Terraces
City Boundaries
Railroads
SCALE

FIG. 1.

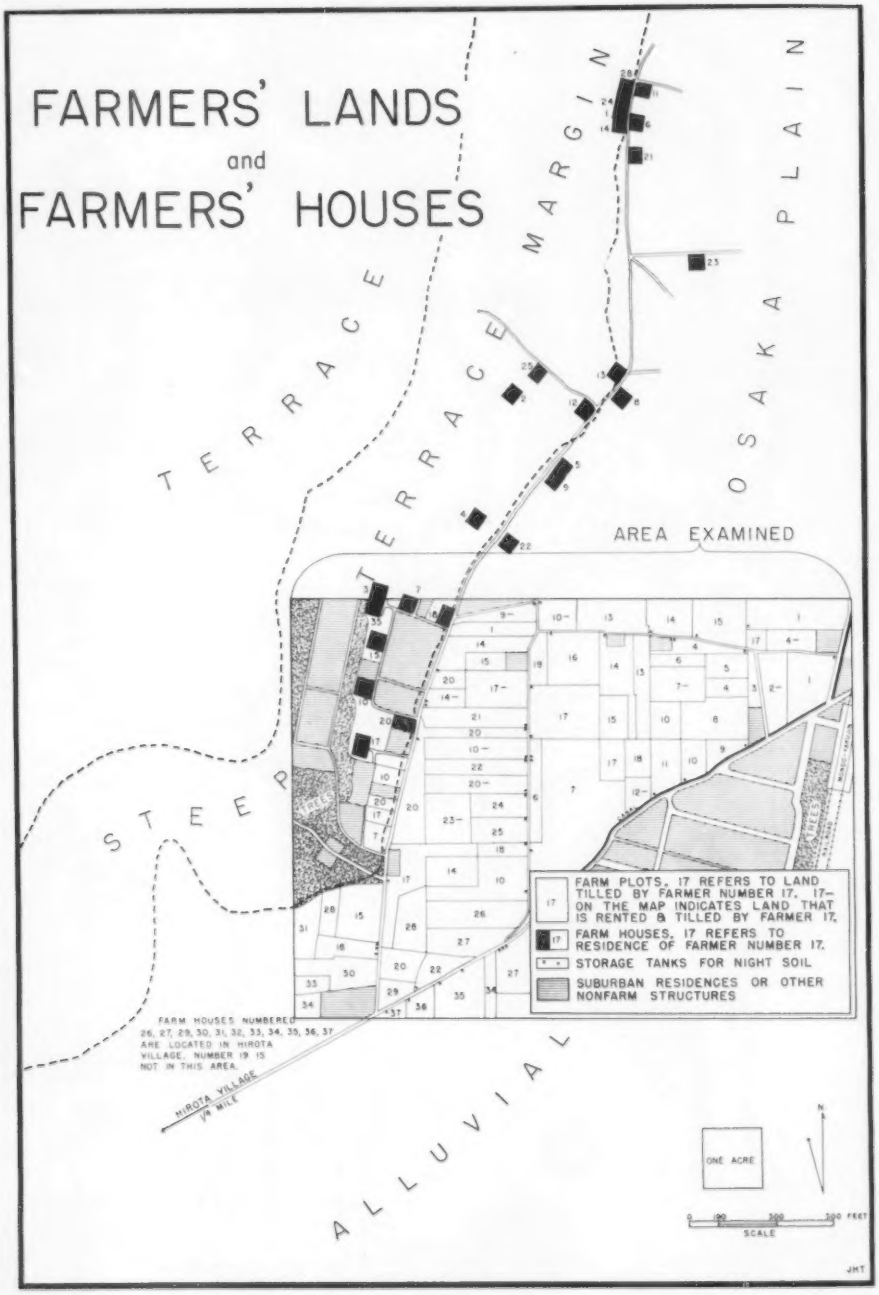
FARMERS' LANDS
and
FARMERS' HOUSES
TERRACE MARGIN
OSAKA PLAIN
AREA EXAMINED
STEEP TERRACE
ALLUVIAL
FARM PLOTS. 17 REFERS TO LAND TILLED BY FARMER NUMBER 17. 17– ON THE MAP INDICATES LAND THAT IS RENTED & TILLED BY FARMER 17.
FARM HOUSES. 17 REFERS TO RESIDENCE OF FARMER NUMBER 17.
STORAGE TANKS FOR NIGHT SOIL
SUBURBAN RESIDENCES OR OTHER NONFARM STRUCTURES
FARM HOUSES NUMBERED 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37 ARE LOCATED IN HIROTA VILLAGE. NUMBER 19 IS NOT IN THIS AREA.
HIROTA VILLAGE
¼ MILE
ONE ACRE
N
0 100 200 300 FEET
SCALE
JMT

FIG. 2

FIG. 3. Looking southeastward from a point above the house of farmer number 4 (use Fig. 2 for location). The encroachment of urbanization on flat agricultural land, as exemplified by this scene, is a real problem in Japan. It points up the ever-increasing need for further intensification of use of the remaining agricultural land. April 10.

China.[3] As the local jurisdictional situation changed the land was sequentially a part of the rural villages of Kanno, Mondo, and Koto.[4] In 1941 it was annexed by the city of Nishinomiya.

FARMERS' LANDS AND FARMERS' HOUSES

Thirty-seven farmers cultivate land within this area and over half of them farm outside the area also. The average land cultivated per farmer is 6 tan (slightly less than 1½ acres). Land holdings are generally non-contiguous and many of the farmers cultivate not only the land they own, but rent some in addition.[5] Property is divided in the usual manner into paddy fields. These fields average no more than .2 of an acre in size, although a few are over one-half acre.

The numbers in the fields in Figure 2 show the location of lands owned and rented by each farmer. Night soil storage tanks (koitsubo) are located at convenient points throughout the area. The night soil is hauled from the many houses in the vicinity and taken to the storage tanks where it is mixed with water and allowed to decompose. When used it is ladled out and carried to the fields in wooden buckets.

The farmers' houses, shown in Figure 2 by numbers corresponding to those in the fields, are situated for the most part just off the plain on the steep terrace margin. Seldom does a half mile sepa-

[3] The Handen system, which partitioned land into squares, was introduced from China in the 7th Century. The basic unit was a square 6 feet by 6 feet (1 tsubo), presumed to be large enough to provide food for one man for one day. The next sized unit (1 tan) included 360 tsubo and was supposed to provide food for one man for one year. Now, 300 tsubo equal 1 tan; 10 tan equal 1 cho; and 1 cho equals 2.45 acres. Property lines induced by the Handen system are in cardinal directions.

[4] Watanabe, *op. cit.*, pp. 39–55.

[5] Usually at least six, and sometimes a dozen or more, parcels of land are worked by one farmer. Eighty-six per cent of the land in the area studied is owner-operated and 14 per cent is rented.

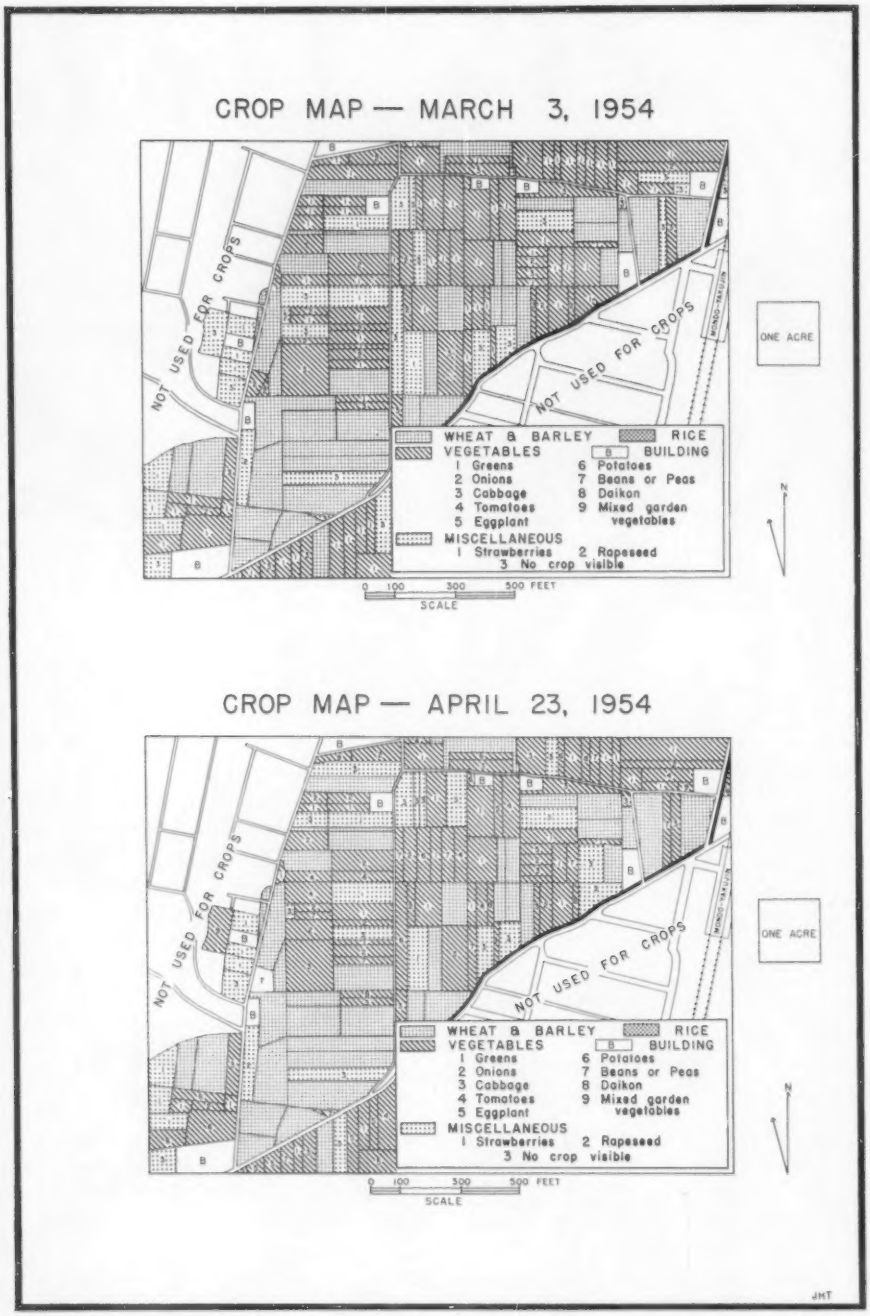
CROP MAP — MARCH 3, 1954
NOT USED FOR CROPS
NOT USED FOR CROPS
ONE ACRE
N
WHEAT & BARLEY
RICE
VEGETABLES
B BUILDING
1 Greens
2 Onions
3 Cabbage
4 Tomatoes
5 Eggplant
6 Potatoes
7 Beans or Peas
8 Daikon
9 Mixed garden vegetables
MISCELLANEOUS
1 Strawberries
2 Rapeseed
3 No crop visible
0 100 300 500 FEET
SCALE
CROP MAP — APRIL 23, 1954
NOT USED FOR CROPS
NOT USED FOR CROPS
ONE ACRE
N
WHEAT & BARLEY
RICE
VEGETABLES
B BUILDING
1 Greens
2 Onions
3 Cabbage
4 Tomatoes
5 Eggplant
6 Potatoes
7 Beans or Peas
8 Daikon
9 Mixed garden vegetables
MISCELLANEOUS
1 Strawberries
2 Rapeseed
3 No crop visible
0 100 300 500 FEET
SCALE
JHT

FIG. 4.

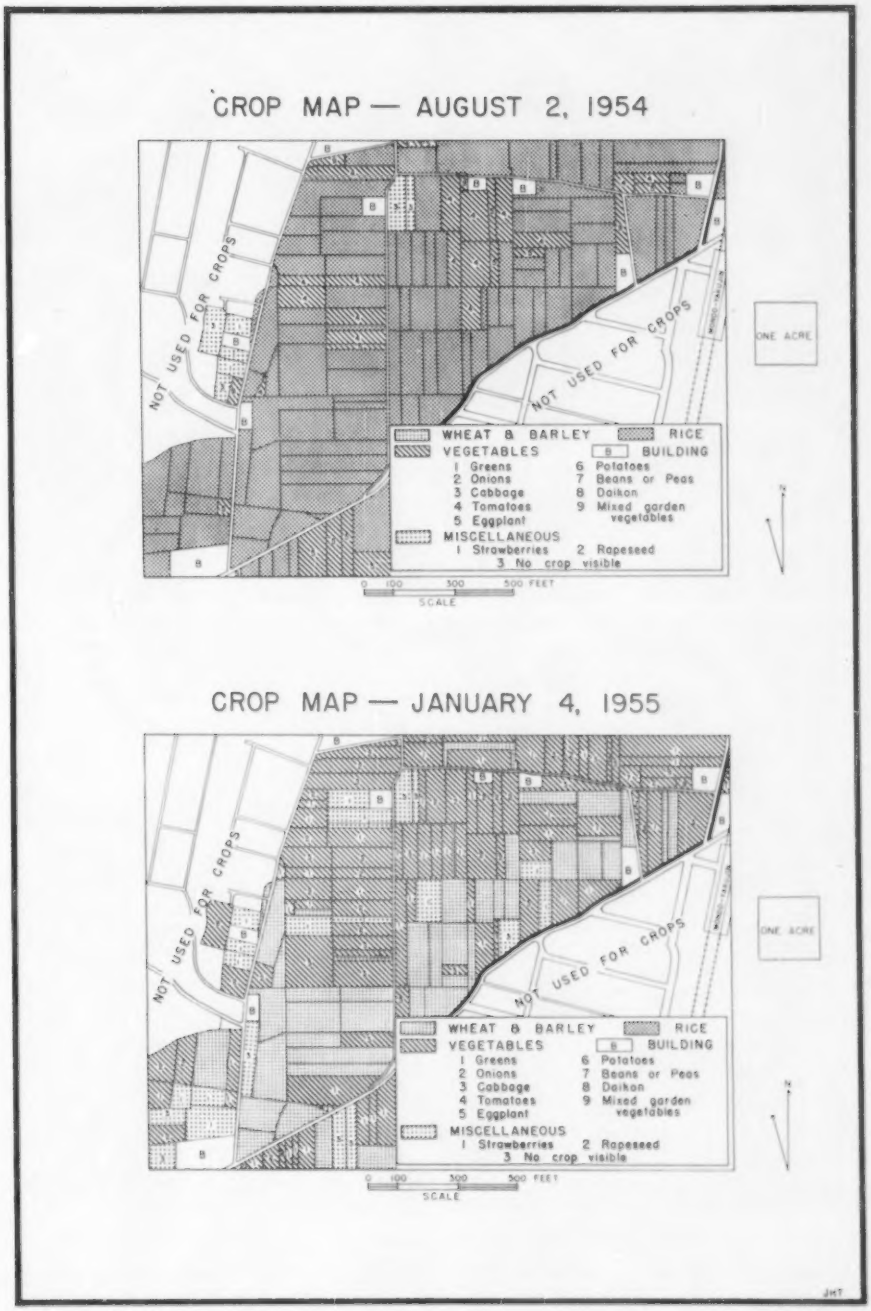
CROP MAP — AUGUST 2, 1954
NOT USED FOR CROPS
NOT USED FOR CROPS
ONE ACRE
WHEAT & BARLEY
RICE
VEGETABLES
B BUILDING
1 Greens
2 Onions
3 Cabbage
4 Tomatoes
5 Eggplant
6 Potatoes
7 Beans or Peas
8 Daikon
9 Mixed garden vegetables
MISCELLANEOUS
1 Strawberries
2 Rapeseed
3 No crop visible
0 100 300 500 FEET
SCALE
CROP MAP — JANUARY 4, 1955
NOT USED FOR CROPS
NOT USED FOR CROPS
ONE ACRE
WHEAT & BARLEY
RICE
VEGETABLES
B BUILDING
1 Greens
2 Onions
3 Cabbage
4 Tomatoes
5 Eggplant
6 Potatoes
7 Beans or Peas
8 Daikon
9 Mixed garden vegetables
MISCELLANEOUS
1 Strawberries
2 Rapeseed
3 No crop visible
0 100 300 500 FEET
SCALE
JHT

FIG. 5.

FIG. 6. Winter crops of greens and onions just below the house-occupied steep terrace margin. The view is westward from the point where the common property line of farmers number 1 and 9 adjoin the north-south road which passes through the central portion of farmed area (Fig. 2). Onions are thriving on the ridges to the right; one row of cabbage intervenes; on the left are greens, again growing on the typical winter field ridges. March 15.

rate a farmer's house and his fields. Those houses which are out on the plain in this immediate area are suburban residences.

For most of the farmers, farming is a full-time job. Work is done by the farmer and his family except during rice planting or during rice, barley, and wheat harvest periods when there is some cooperative effort between families. As many women as men are ordinarily seen in the fields and during rush work periods they even outnumber the men. The working day extends nearly from daybreak to darkness and there is much to be done in all seasons.

LAND USE AROUND THE YEAR

Urban agriculture is characterized by multiple cropping and round the year land use. Seldom is a field idle for longer than a week or two at a time for the harvest of one crop is followed almost immediately by the planting of another. Each farmer devotes most of his land to rice in summer and then plants part of his property to wheat or barley which provides one winter crop, and part to vegetables which results in several winter crops. The patterns of land use are a reflection of each farmer's wish to plant rice, winter grains, and vegetables, rather than of variations in soil, supply of irrigation water, drainage, or other physical conditions.

To identify the land use pattern and the procession of crops around the year, crop maps were made on March 3, April 23, and August 2, 1954, and on January 4, 1955. The crop maps show that only 2 per cent of the fields contained just one crop during the year;

21 per cent contained two crops; 56 per cent, three crops; and 21 per cent, four crops. Although it was impossible to show it on the four maps, at least six crops actually were harvested from some of the land.

The Crop Map for March 3, 1954

On March 3 (Fig. 4) 47.4 per cent of the land was in vegetables, 34.3 per cent in wheat and barley, and 18.3 per cent in miscellaneous which was equally divided between strawberries and no crops visible. All crops were planted in the usual manner on ridges 6 to 10 inches high and 15 to 30 inches across. These ridges were designed to insure adequate drainage for the winter crops. The wheat and barley, planted in rows on the ridges, were 3 to 5 inches high; vegetables, largely greens but including onions and cabbage, were in varying degrees of maturity. Greens were being harvested in a number of fields and loaded on bicycles, two-wheeled carts, or small three-wheeled trucks for transport to nearby urban markets.

Throughout March and early April greens were harvested, and new plantings were made by setting out plants 2 to 4 inches high. Onions, beans, daikons, and other crops, too, were planted. On April 1st one farmer started a large field of tomatoes beneath a temporary greenhouse made of poles and transparent plastic. No other tomato plants were set out until April 20. Strawberry plants were flourishing. By April 5th several farmers had planted eggplant beneath paper-covered bamboo wickets. The wickets again served as tiny greenhouses to speed up growth.

FIG. 7. Preparing the field for the summer rice crop. Levelness is necessary and clods must be broken. The view is again westward toward the steep terrace margin from a point where the property of farmers number 20 and number 21 adjoin the centrally located north-south road (Fig. 2). Farmer 21 is smoothing his rice paddy and breaking up the clods of soil. The ox, pulling a heavy toothed, rake-like tool, is used for this purpose. Tomatoes occupy the field on the left. The author lived for a year in a house just beyond the bamboo grove in the background. June 25.

FIG. 8. Several families cooperate at rice transplanting time. Here work is taking place on the property of farmer number 15 just west of the suburban residence shown on Figure 2 in the northwestern part of the agricultural area. Joints on bamboo poles laid crossways to the rows guide the spacing of the tiny rice plants. July 1.

FIG. 9. Young rice and competing tomatoes at bearing stage. The picture is of the same area as that of Figure 6. Farmer 9- has changed from onions to rice and farmer 1 from greens to tomatoes (Fig. 2). Even dikes between fields are used. July 10.

The Crop Map for April 23, 1954

On April 23 (Fig. 4) 47.7 per cent of the land was in vegetables, 34.3 per cent in wheat and barley, and 18 per cent in miscellaneous. This is the same percentage as found on the March 3 map, but with the progression of spring the variety of vegetables had increased to include all nine categories mapped. Wheat and barley were 12 to 15 inches high and beginning to head out. Greens and small onions were being harvested, strawberries were blossoming, and rapeseed was past the flower stage. Potatoes were just coming up.

During May much effort was given

FIG. 10 (left). Young rice needs cultivation and the soil must be aerated. Both of these are accomplished by pushing a small drum-like cultivator along between the rows. The shorts worn by the man are unusual but practical. Rain was falling so the woman was wearing a plastic sheet over her back. This sheet is a better protector when she is bent over weeding than when she is upright, pushing a cultivator. The woman's straw hat is designed as protection against the sun, not the rain. View is eastward over the property of farmer number 20 in the southwestern part of the agricultural area. July 15.

FIG. 11 (right). Ripened grain is cut with a hand sickle. Here wheat is being cut and carefully laid across the depressions between field ridges so that it will dry properly. Rice is always tied into small bundles and hung on pole racks to dry. Farmer number 20, his wife, and his son are working on the same parcel of land shown in Figure 10. June 12.

to the staking of tomato plants. For this purpose an elaborate framework of poles and crossmembers tied together with straw is used. Tomatoes, greens, and onions were generously fertilized with farm manure and night soil. The strawberry season lasted from about May 1 to June 15, after which time the plants were all taken out of the fields and put into nursery beds.

About May 15 rice seed beds were started and in a few days the green rice plants appeared above the standing water. Eggplant and tomatoes were rather extensively planted during this time too, and obviously were to become competitors with the rice crop. Except for spinach, most of the greens were harvested by May 28. Barley harvest began about May 28 and was completed during the following week. All cutting of the grain is done with a small hand sickle. Each handful of grain is laid carefully across the field ridges so that it doesn't get in the water which frequently stands between the ridges. Generally it is gathered and tied into bundles before being threshed. Gasoline powered mechanical threshers are used by most farmers. Some have purchased their own; others rent them. One man feeds the heads of grain through the machine, another takes away the straw, and two or three (usually women) bring the grain to the machine. The chaff generally is burned although a few of the farmers put it back on the fields and plow it under. Most of the straw is used for animal bedding or put back on the fields.

From June 10 to June 17 the wheat was harvested, after which immediately began the plowing and other preparation of the fields for rice. A single share steel plow pulled by an ox is used. After plowing, the fields are flooded and fertilized, the clods of dirt broken up, and the ground made perfectly level.

The third week of June was the beginning of the rice planting season. Rice plants are taken from the seed beds and transplanted by hand into the fields about 10 inches apart. During early July the rice was weeded and cultivated with small hand cultivators. After July 20 activity in the fields was confined to sporadic weeding, thinning and fertilizing.

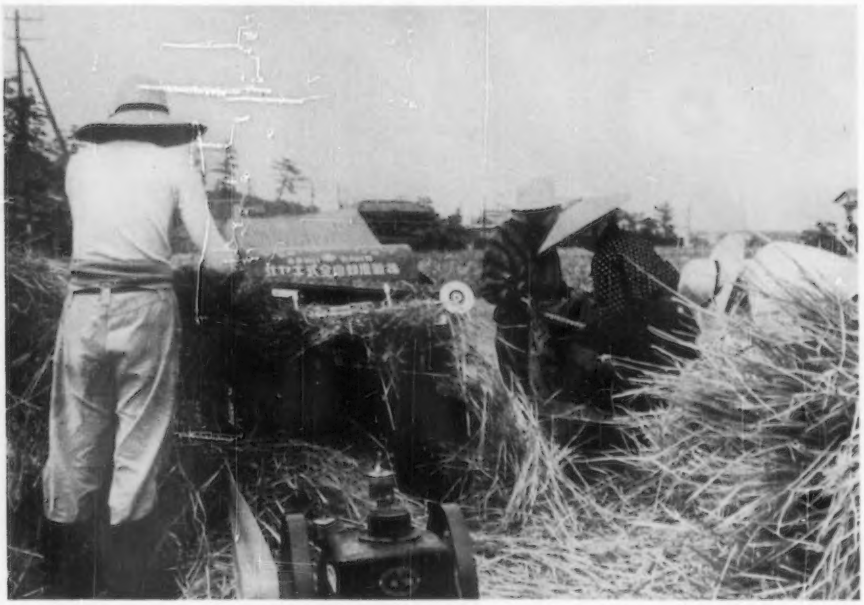

FIG. 12. Small gasoline threshing machines are commonly used. The operator inserts only the heads of the grain into the machine, hanging onto the straw. In this case wheat is being threshed, but the same procedure is used for barley and rice. June 16.

Crop Map for August 2, 1954

On August 2 (Fig. 5) 16.6 per cent of the land was in vegetables with only tomatoes and eggplant apparently able to compete with rice. A comparison of Figures 2 and 5 shows that 18 of the 33 farmers devoted some of their land to these two crops. Most of the rest had vegetable plots outside the area mapped. The proportion of the land in rice was 80.3 per cent, and 3.1 per cent was in miscellaneous. The average size of individual fields is greater than on any of the other maps.

By August 15 the rice was 15 to 18 inches high. The eggplants were through producing and some of the tomato fields were being cleared. The rice began to head out about September 5. Shortly thereafter the farmers used string around and across the paddy fields, attaching pieces of tinfoil or paper to the strings. This is to keep birds from eating the rice kernels. Scarecrows are also employed for the same purpose. By September 15 greens and onions were being planted in the eggplant and tomato fields.

Rice harvest began for early varieties on October 10. Drying racks were erected in the fields and the rice was hung on them for several days to several weeks before threshing. By November 10 all of the rice had been cut and threshed.

Almost as soon as the rice was taken from the fields, even often before it was removed from the drying racks, plowing and ridging of the fields for winter crops began. By December the scene was similar to that of the previous March.

Crop Map for January 4, 1955

The January 4 crop map (Fig. 5), when examined together with the March 3 and April 23 maps, provides a span

FIG. 13 (left). The honey bucket or night soil wagon is a common vehicle on the narrow streets. Farmers collect night soil from nearby houses and haul it to field storage tanks in these wagons. The small, sloping, low roof on the left shelters a night storage tank. This wagon is rounding the corner of the property of farmer number 9- in the northern part of the area. The night soil storage tank is shown in Figure 2. August 2.

FIG. 14 (right). Night soil is taken from the storage tanks to the fields in large wooden buckets balanced on 6-foot long wooden poles. Only by generous application of night soil throughout past centuries have these soils been kept so productive. Here a farmer is ladling night soil from the buckets onto new strawberry plants. The fields have been ridged and planted to a winter crop even before the rice has been removed from drying racks in the background. November 15.

of two years of winter land use. It shows return to an emphasis on vegetables and grains. Fifty-three and seven-tenths per cent of the land was in vegetables, 31.4 per cent in wheat and barley, and 14.9 per cent in miscellaneous. Greens were the most widespread of the vegetables again, and onions and cabbage were also important. Strawberries had been taken out of the nursery beds and transplanted in the fields. Early crops of greens were already being harvested and continued to bring in revenue to the farmers throughout the winter and spring.

CONCLUSIONS

The rather widespread summer planting of high value vegetables such as tomatoes and eggplant on land that otherwise would be in rice illustrates some departure from the usual Japanese summer cropping scheme. But winter crop patterns with emphasis on multiple

TABLE I

PER CENT OF CROP LAND IN VARIOUS CROPS

	March 3 1954		*April 23 1954*		*August 2 1954*		*January 4 1955*	
Wheat and Barley	.....	34.3	.....	34.3	.....	00.0	.....	31.4
Vegetables	.....	47.4	.....	47.7	.....	16.0	.....	53.7
Greens	32.9	.....	13.4	.....	.....	.....	22.5	.....
Onions	6.4	.....	7.5	.....	.....	.....	14.7	.....
Cabbage	8.1	.....	8.0	.....	.....	.....	14.1	.....
Tomatoes	.....	.....	5.3	.....	9.7	.....	.....	.....
Eggplant	.....	.....	1.9	.....	5.5	.....	.....	.....
Potatoes	.....	.....	4.7	.....	.....	.....	.....	.....
Beans	.....	.....	4.7	.....	.....	.....	0.8	.....
Daikon	.....	.....	1.1	.....	.....	.....	.....	.....
Mixed Garden Vegetables	.....	.....	1.1	.....	1.4	.....	1.6	.....
Rice	.....	00.0	.....	00.0	.....	80.3	.....	00.0
Miscellaneous	.....	18.3	.....	18.0	.....	3.1	.....	14.9
Strawberries	5.5	.....	5.5	.....	0.9	.....	10.5	.....
Rapeseed	0.9	.....	0.9	.....	.....	.....	.....	.....
No Crops Visible	11.9	.....	11.6	.....	2.2	.....	4.4	.....
Totals	.....	100.0	.....	100.0	.....	100.0	.....	100.0

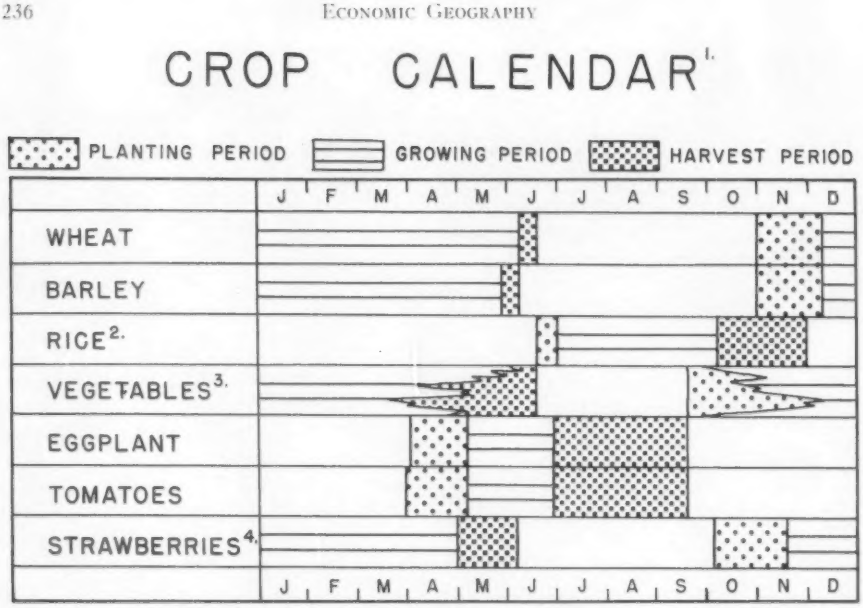

FIG. 15. Crop calendar. Footnotes: (1) As both early and late varieties of most crops are represented, the planting and harvesting periods are longer than they would be for any single variety. Eggplant, tomatoes, and strawberries, moreover, are crops that produce for a considerable period. (2) Planting refers to the transplanting of plants into paddy fields. (3) Planting of cabbage, onions, greens, and other winter vegetables begins as soon as summer crops are off the fields. Sometimes seeds are put directly in the fields, but more commonly they are started in seed flats. Harvest dates range from October to June depending on type of crop and date of planting. (4) Planting refers to the transplanting from nursery beds to the fields. Plants are kept in nursery beds during the summer so as not to compete with rice.

cropping of vegetables most clearly characterize urban agriculture wherever it was seen in southern Japan. The March, April, and January crop maps vary in detail but are generally similar. If these three maps are averaged to characterize winter production it is found that 50 per cent of the area was devoted to vegetables of which greens accounted for 23 per cent, onions 10 per cent, and cabbage 10 per cent; 33 per cent to wheat and barley; and 17 per cent to the miscellaneous category of which strawberries alone amounted to over 7 per cent. Two, three, four and even more crops were harvested during the winter season.

Such multiple cropping exemplifies an intensiveness of agricultural land use seldom equalled even in oriental cultures. The percentage of cultivated land in crops for Japan as a whole is 144; for the Inland Sea area, 130 to 170;[6] for this area of urban agriculture, 310.[7] Interviews with farmers in the area indicate that the rice crop was valued at about 20,000 yen per tan ($225 per acre) in 1954, and the winter wheat and vege-

[6] Edward A. Ackerman: *Japan's Natural Resources*, University of Chicago Press, 1953, p. 78.

[7] Percentage of cultivated land in crops equals the total area planted divided by the area of cultivated land. The area of cultivated land here is 33 acres. Thirty-two and one-half acres were planted to summer crops and an average of 11 acres of winter grains appear on the crop maps. These maps also show an average of 16 acres in winter vegetables. The 16 acres could be conservatively assumed to produce three crops; and 5.5 acres in numbers 1 and 3 of miscellaneous, two crops. This makes a total of 102.5 acres. One hundred two and one-half acres of area planted divided by 33 acres of cultivated land gives a percentage of cultivated land in crops of 310.

table crops at from 20,000 to 40,000 yen per tan ($225 to $450 per acre) depending on the per cent of land devoted to vegetables.[8] This is from $450 to $675 per acre or about $660 to $1000 per 6-tan farm.[9] Such yields are one and one-half to two times those of areas in which the two-crop rice-wheat system is practiced, and two to three times those in northern Japan where only one crop of rice can be raised.

Urban agriculture seems to be one answer to city growth in Japan. The higher per unit area production associated with it will help offset the loss in food production accompanying the spread of the cities over cultivatable land on the plains.

[8] One tan equals .245 of an acre. Conversion of yen to dollars was made at the official exchange rate of 360 yen to one dollar.

[9] Realistic international comparisons of the meaning of money are difficult but the author's observations about relative levels of living would indicate that the $660 to $1000 income in Japan might be compared with $3300 to $5000 in the United States.

LOURENÇO MARQUES IN DELAGOA BAY*

William A. Hance and Irene S. van Dongen

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LOURENÇO MARQUES has long been an important outlet for Southern Mozambique and one of the major gateways for the great mineral and industrial area of the Transvaal in the Union of South Africa. In August, 1955, the Pafuri Link or Limpopo Railway was completed, tying the port with the rapidly developing but landlocked areas of Northern and Southern Rhodesia and with the adjacent realm of Union Minière du Haut Katanga in the southeastern Belgian Katanga. Beira in Central Mozambique previously handled 80 per cent of the total overseas trade of the Central African Federation, but congestion at that port and on its feeder rail lines made it necessary to secure a new outlet and the choice fell on Delagoa Bay.[1] Connected with several of the most vigorous economic regions of the continent (Fig. 1), Lourenço Marques promises to achieve even greater significance as one of the outstanding African ports.

An analysis of the harbor and port of Lourenço Marques and of its relations with the tributary areas is important in assessing the long-range transport programs of the Rhodesias, the Union, and Mozambique.

The Port of Lourenço Marques

The harbor of Lourenço Marques has for centuries been considered as the finest shelter of the entire eastern coast of Africa from Suez to the Cape. The total anchorage area in Delagoa Bay is close to 10,000 acres. Located outside the normal path of cyclonic storms, it is protected from the southeastern winds of the Indian Ocean by the Inhaca (Inyack) Peninsula and Inhaca Island (Fig. 2). Three entrance channels lead to the inner port through the Polana Canal, now dredged to a minimum low water depth of 27 feet. Though pilotage is obligatory, access is not difficult. Vessels drawing over 31 feet usually wait for the high tide before entering.

The port and city of Lourenço Marques are situated 25 miles from the open sea. While most of the larger African seaports did not have deep-water berths until the second quarter of the present century, Lourenço

*This article is the fifth in a series on port terminals serving the central belt of Africa prepared under a Columbia University contract with the Office of Naval Research. Reproduction in whole or in part is permitted for any purpose of the United States Government. The authors wish to thank the Office of Naval Research, Geography Branch, for support of the project, and the many people in the United States, Portugal, and Africa who have been instrumental in furthering field and library research throughout 1955–56.

[1] See William A. Hance and Irene S. van Dongen: "Beira, Mozambique Gateway to Central Africa," *Annals Assn. of Amer. Geogrs.*, Vol. 47, 1957.

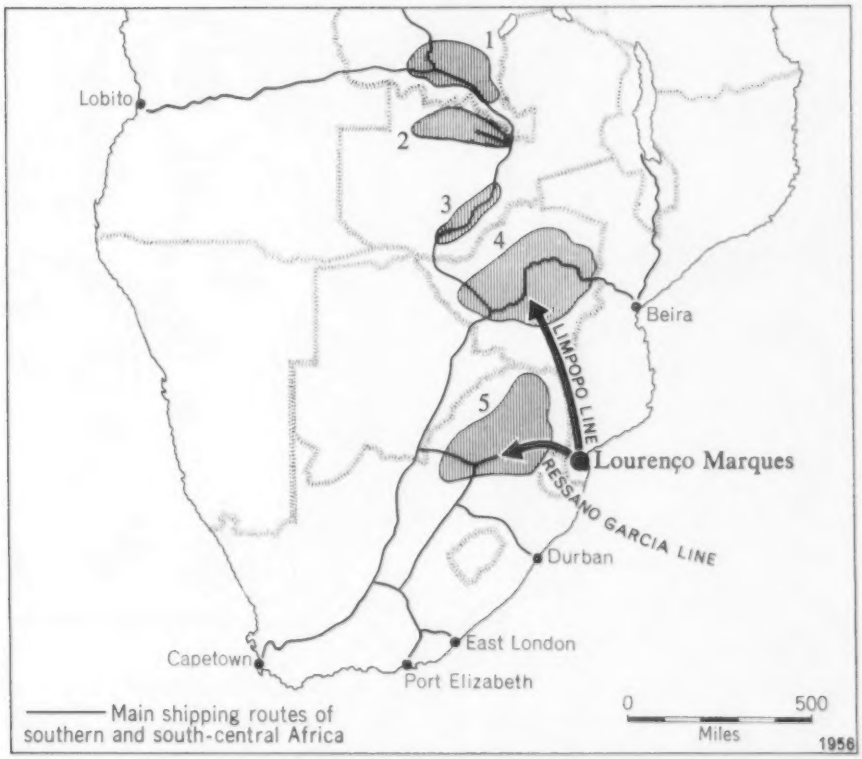

FIG. 1. Location of Lourenço Marques in relation to the leading economic regions of south-central Africa: (1) southeastern Katanga mining and processing area; (2) Northern Rhodesian Copperbelt; (3) Northern Rhodesian agricultural-processing area; (4) Southern Rhodesian mining, processing, and major agricultural area; (5) Transvaal mining and industrial area.

Marques opened its first such wharf in 1903, a year ahead of Durban. The reclamation of tidewater land proceeded rapidly, and by 1914 the port area on the north shore of the estuary had assumed almost its present form (Fig. 3). Only limited extensions of the marginal quay in 1930 and 1951 were required to reach the present total length of 2430 yards (Fig. 4). This quay, with alongside depths of 30 to 45 feet, can accommodate 15 ocean-going vessels.

The most conspicuous features of the port are the two electric coal loaders at the Gorjão Wharf (Fig. 5) and a cold-storage plant for fruit. The mechanical coal loaders, with a combined capacity of 10,000 tons of coal a day, are used in the handling of Transvaal coal. The cold storage plant, which has a capacity of 30,000 boxes, is used for storage and other handling operations associated with the forwarding of Transvaal and local citrus production (Fig. 8). If mineral shipments increase substantially from the Rhodesias, construction of a special berth with mechanized loading gear may become urgent.

Four miles up the estuary at Matola, the seat of much of the industry of Lourenço Marques, are a pier for unloading bulk petroleum products (Fig. 7) and lumber wharves. The petroleum

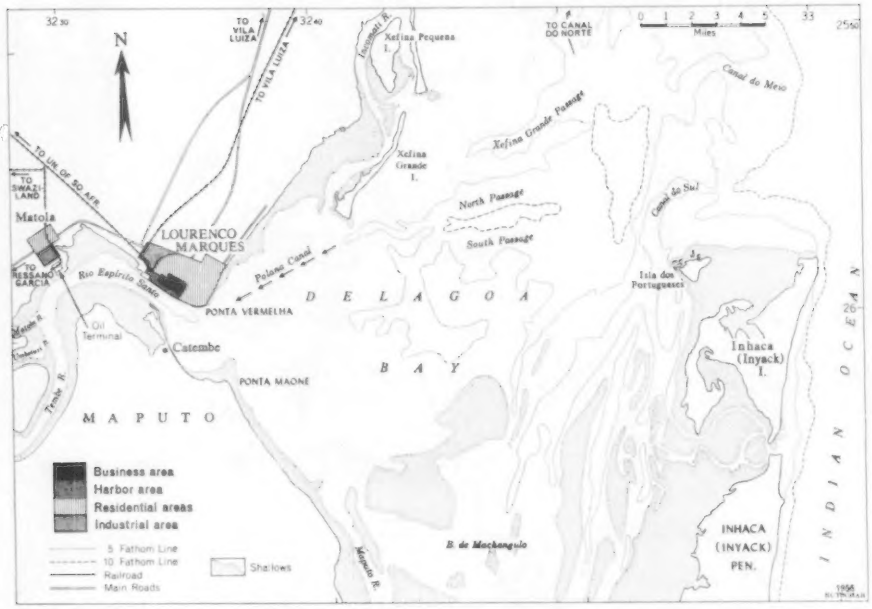

FIG. 2. Harbor and city of Lourenço Marques in Delagoa Bay (adapted from H.O. charts Nos. 2543 and 2636, and from various Portuguese maps).

terminal installations here, maintained by four major oil distributors, have a storage capacity of 120,000 tons of liquid fuels. Some of the petroleum, which is used mainly in bunkerage or in the city itself, is still handled at the Gorjão Wharf.

Gorjão Wharf is also used by coastal vessels, there being an active cabotage trade along the Mozambique coast. The small-boat basin (cf. Fig. 4) is used only by ferries which cross the estuary and by a few fishing boats. Fishing is unimportant at Lourenço

FIG. 3. Gorjão Wharf and Rio Espírito Santo viewed from northwest. In the forefront are the C.F.M. coal and mineral yards; the railway station is in the left center. Part of the Lourenço Marques business section can be seen to the left rear. (Courtesy of C.F.M.)

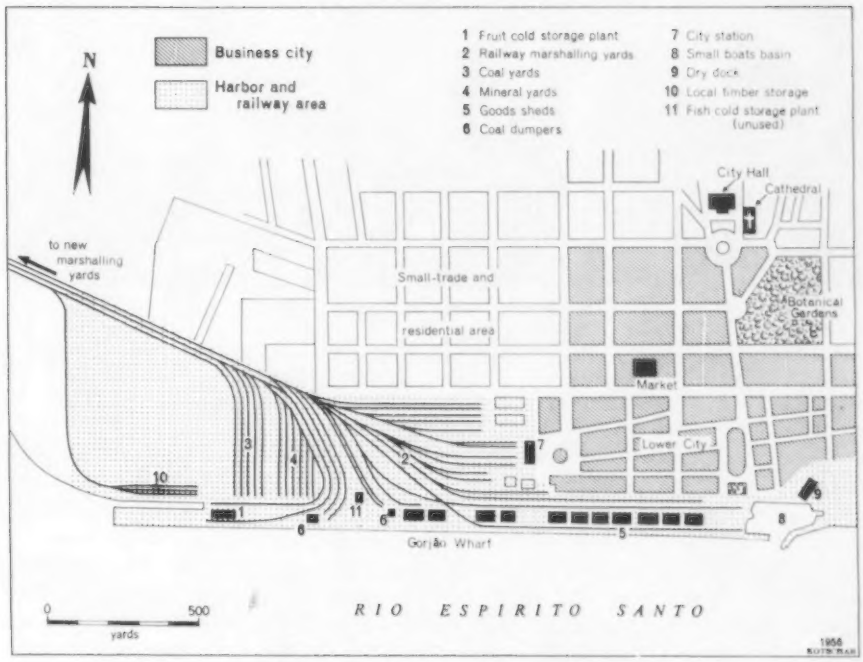

FIG. 4. Lourenço Marques port area (detail).

Marques, as the good fishing banks lie much farther to the south in the waters of the Union. A modern cold-storage plant for fish, opened in 1950, was forced to close indefinitely in 1954.

The port of Lourenço Marques now has an estimated handling capacity of 7 million tons, substantially above the actual level, which was 3,903,836 metric tons in 1954. Although this figure was more than double the prewar level, the increase was not relatively as great as in other leading African ports. The unused capacity at Lourenço Marques was an important consideration in deciding upon the new Limpopo link with Central Africa.

Table I shows the evolution and structure of Lourenço Marques' trade in 1938, 1948, and 1954. Note the relatively small increase in number of ships berthed, the greater increase in tonnage of shipping being explained by the larger size of modern ships. The outstanding feature of the cargo handled is the high level of bulk commodity traffic in both exports and imports. The tonnage of bunkering fuels has declined, but only because of the switch from coal to oil. The range and volume of liquid fuels available, and reduced port entry rates for vessels that call for bunkerage only, continue to sustain bunkering traffic.

Before turning to the hinterlands of Lourenço Marques, a brief description of urban developments and manufacturing interests will assist in understanding the complex role of the terminal.

URBAN DEVELOPMENT

The initial Portuguese settlement in the estuary of Espírito Santo dates to 1544. In the next three centuries

FIG. 5 (left). Loading Transvaal coal into S.A.R. coaling vessel in transit to the Union ports, at coal dumper No. 1, Lourenço Marques.

FIG. 6 (center). Unloading Scandinavian timber destined for the Transvaal at Gorjão Wharf, Lourenço Marques.

FIG. 7 (right). Oil pier at Matola bulk petroleum terminal, Lourenço Marques.

there were a number of commercial bases in Delagoa Bay which were periodically destroyed. Between 1870 and 1895 final agreements were reached by Portugal and Great Britain regarding territorial rights in that part of Africa, whereupon Lourenço Marques received the status of a city and became the capital of Portuguese East Africa.[2]

Lourenço Marques is poorly situated to function as the political and economic hub of the country, being too close to a foreign border and too far from the main domestic centers of raw material production. But its great commercial activity, the early concentration of administrative personnel, and the later gradual build-up of industry have made the city the incontestable leader in Mozambique affairs. The competitive position of Beira, the second prominent Mozambique city and the only potential rival, was weakened by its operation until 1942 by a British-Portuguese concessionary, the Mozambique Company.

Well planned, spacious, and clean, with many handsome modern buildings, Lourenço Marques enjoys the reputation of being one of the most attractive African cities. Its population reached 110,000 in 1954, including half of Mozambique's total white population of about 60,000. During the winter, from July to September, the numbers are further increased through a considerable influx of South African tourists, and it is hoped that Lourenço Marques will now be used also as a tourist center for the Rhodesias.

Shipping forwarders and receivers, representatives of South African companies, and other commercial establishments are concentrated in the Lower City adjacent to the wharves (cf. Fig. 4). Since the completion of the Limpopo Railway, Rhodesian interests are also opening offices. The industrial and residential suburbs are expanding steadily to the northwest and northeast respectively. The new airport at Mavalane is the terminal of several inter-African air routes.

Manufacturing at Lourenço Marques includes flour milling; tanning; brewing; production of cement, glass, and other building materials; edible oils, margarine, and soap production; Coca-Cola and mineral water bottling; preparation of cashew nuts; processing of tobacco; and the preparing of foodstuffs and other household needs in a variety

[2] See José de Oliveira Boléo: "Geografia das Cidades—Lourenço Marques," *Boletim da Sociedade de Geografia de Lisboa*, 1945, 63a Série, nos 5–6, pp. 5–15.

TABLE 1

LOURENÇO MARQUES PORT TRADE IN 1938, 1948, 1954

(In metric tons unless otherwise indicated)

	1938	*1948*	*1954*
Number of ships berthed	1,015	986	1,228
Gross registered tonnage of shipping berthed	6,139,299	5,619,633	8,482,757
Total cargo handled (including bunkers)	1,865,304	2,951,072	3,903,856*
Passengers handled (embarked and disembarked)	92,802	96,760	67,993
I. EXPORTS THROUGH THE PORT	*584,609*	*1,296,726*	*1,842,785*
Coal (excluding bunker coal)	333,013	658,888	726,168
Minerals	154,759	359,816	648,647
Fruit (mostly citrus)	5,850	10,922	37,927
General cargo	90,987	267,100	430,043
II. IMPORTS THROUGH THE PORT	*977,510*	*1,371,188*	*1,904,376*
**Petroleum Products (at Matola and Gorjão)	211,773	716,160	1,116,919
†Timber (at Matola and Gorjão)	240,566	168,711	214,859
General cargo	525,171	486,317	572,598
III. TRANSSHIPMENT TRADE	n.a.	116,750	116,591
IV. BUNKERING TRADE (fuels only)	.....	*283,158*	*156,693*
Coal	303,185	226,363	21,162
Fuel oil	n.a.	56,795	135,533

*Of which about 155,000 t. in coastal trade.

**PETROLEUM PRODUCTS
1938—18,182 t. at Gorjão and 193,591 t. at Matola (approximate figures).
1948—211,269 t. at Gorjão and 504,891 t. at Matola.
1954—609,034 t. at Gorjão and 573,885 t. at Matola.
The gasoline and kerosene are disembarked largely at Matola whereas the mineral oil imports are handled in equal parts at Lourenço Marques' main wharf and at Matola pier.

†TIMBER
1938—86,880 at Gorjão and 153,686 lightered midstream.
1948—48,063 t. at Gorjão and 120,648 t. lightered midstream and at Matola.
1954—76,130 t. at Gorjão and 138,749 t. lightered midstream and at Matola.

Sources: 1938, 1948: Mozambique. Administração dos Servicos dos Portos, Caminhos de Ferro, e Transportes (C.F.M.) *Relatório de Ano Económico 1938, 1948*, pp. 119-122, and pp. 150-151.
1954: C.F.M. Administration Records.

of small establishments. Domestic raw materials come to the city from considerable distances to supply these plants. Many of the smaller factories date from pre-war years; the larger plants, such as the flour mill of Companhia Industrial de Matola, the cement factory, and the breweries, are post-war enterprises.

The capital has always been an important consuming center for vegetable and fruit produce from the surrounding rural districts, and the market gardening zone even extends some distance into Swaziland and the Transvaal.

THE HINTERLANDS OF LOURENÇO MARQUES

The tributary area to Lourenço Marques is made up of several political units: the domestic area, the Union of South Africa, Swaziland, the two Rhodesias, and the Belgian Katanga. It is largely served by the southern Mozambique rail system and connecting extraterritorial rail lines. The first rail link completed extended from the port to Pretoria via Ressano Garcia, Komatipoort, and the Witbank coal fields. It was constructed by American, Portuguese, and Dutch concessionaires between 1886 and 1894. The

strong feeling in the Union against dependence on this line through a foreign territory soon led, however, to connecting the Transvaal with the national outlet of Durban. Its inner harbor had been improved by cutting an entrance channel through an obstructing sand bar and by the construction of large port installations.

In 1912 a second rail line from Lourenço Marques to Johannesburg was begun. Its route was to pass through the Swaziland Protectorate and the Breyten coal fields, but conflicting interests resulted in its being laid only as far as Goba, near the Mozambique border, which remains the present terminus.

Before 1925, two additional branches were added to the main trunk, but solely to serve the domestic hinterland and particularly to assist the Portuguese agricultural settlement in the fertile Incomati Valley.[3] Finally, in August, 1955, the Limpopo line was connected with the Rhodesian Railways by the 400-mile Pafuri Link.

The breakdown of rail traffic on the 325-mile rail system (C.F.M. See footnote 3) of southern Mozambique is shown in Table II. It is too early to know what share of Lourenço Marques trade will be brought in by the new link to the Rhodesias, but in the past the major port hinterland has been in the Union of South Africa.

THE UNION HINTERLAND

In 1954 the transit flow to and from the Union on the Ressano-Garcia main line was 79.6 per cent of the total rail traffic of southern Mozambique. All of this traffic originates in or is destined for the Transvaal Province (Fig. 9).

The Transvaal is the most important producer of base minerals, gold, platinum minerals, uranium, and coal in the Union. The area of the Rand (Fig. 10) combined with that of Pretoria and the southern portion of Transvaal is also the leading industrial region of South Africa, having about 45 per cent of the workers employed in industry and producing approximately half of the total industrial output of the Union by value. The presence of about 40 per cent of the white population of the Union contributes to the high consumption power of the province. From the agricultural standpoint, the Transvaal is a great producer of maize, wheat, tobacco, and citrus fruit; with extensive ranching practiced near the Southern Rhodesia border.[4]

The 55-mile line (3 ft. 6 in. gauge) to the Transvaal border is built to carry heavy traffic. Using 120 lb./yard track, it easily bears trainloads of 1500 tons, which compares very favorably with many African lines, including the Beira Railway with a trainload capacity of 800 tons. The line is single track except for the first six miles and has an average daily traffic of 50 trains in both directions. The present yearly capacity of the line is estimated to be between 4 and 4.5 million tons of goods, while the actual traffic is about 3 million tons. By modernizing equipment and extending the marshalling yards, the capacity could quickly be doubled, but the necessity to do so has not as yet arisen. Thirty-five hundred miles of rail belonging to the South African Railways Administration to-

[3] See Mozambique: Administração dos Servicos dos Portos, Caminhos de Ferro e Transportes (C.F.M.): *Relatório do Ano Económico 1938*, Lourenço Marques, 1939, pp. 13–16; South African Railways, Public Relations Department: *South African Railways: History, Scope and Organization*, Johannesburg, 1947, pp. 18–21.

[4] See John H. Wellington: *Southern Africa, A Geographical Study*, Cambridge University Press, 1955, 2 vols.; U. S. Department of Commerce: *Investment in Union of South Africa, Conditions and Outlook for United States Investors*, Washington, 1954, 148 p.

gether with a considerable mileage of S.A.R.-operated motor services serve the province of Transvaal.

The major seaports of the Union—Capetown, Port Elizabeth, East London, and Durban—have always looked upon Lourenço Marques as a somewhat unwelcome competitor for the valuable Transvaal traffic. The entire South African Railways' freight-rate system was designed to minimize the attraction of the Delagoa Bay gateway, which has a distinct distance advantage over the other ports.[5] However, a chronic shortage of African manpower in the Rand mines and the availability of native labor in Mozambique gave that country sufficient bargaining power to secure a share of the Transvaal's import traffic.

THE MOZAMBIQUE CONVENTION AND TRANSIT IMPORTS TO THE UNION

The Mozambique Convention, first signed in 1909,[6] and later modified by several amendments, guarantees to Lourenço Marques a minimum of 47.5 per cent of transit traffic destined for a region defined as the "competitive area" extending between the stations of Pretoria, Springs, Germiston, Vereeniging, and Klerksdorp. Due to congestion on the South African Railways, the actual traffic for this zone that passes through Lourenço Marques rose to 62.1 per cent of the total in 1954. In return for the stipulated routing of traffic via Mozambique, the Union receives 65,000 to 85,000 Africans recruited south of Latitude 22°S. in the domestic hinterland of Lourenço Marques. These natives work under a one-year contract on the Rand under the supervision of the Witwatersrand Native Labour Association.

FIG. 8. Inspection of Transvaal citrus fruit at Lourenço Marques cold-storage warehouse prior to shipment (F. Rosa de Oliveira).

Table III gives the distribution of Transvaal imports to the competitive area by its five chief ocean gateways in 1948 and 1954, revealing the leading role of Lourenço Marques. Comparable data are not available for the whole of the Transvaal, but Lourenço Marques ranks third among ports handling the total imports of the Union. In 1954 it accounted for 16 per cent of the total volume and 6 per cent of the total value of imports to the Union moving through the five important ports.[7]

The two outstanding imports to the Transvaal via Delagoa Bay have been petroleum products and timber. The port handles about one-quarter of all Union timber imports from overseas, or some 100,000–150,000 tons a year (Fig. 6). The shortage of saw timber in the Union accounts for this heavy inflow, mainly in raw and semi-manufactured timber. Petroleum products accounted for one-third of tonnage traffic moving through Portuguese territory to the Union before the war and one-half of such movements in post-war years. In 1953 petroleum products represented almost 90 per cent of the value of

[5] The distances by rail from Johannesburg are as follows: Lourenço Marques, 395 miles; Durban, 494 miles; Port Elizabeth, 714 miles; Capetown, 956 miles.

[6] Great Britain: British and Foreign State Papers 1908–1909, Vol. CII, H.M.S.O. London, 1913, pp. 110–120.

[7] Union of South Africa: South African Railways and Harbours Administration: *Report of the General Manager of Railways and Harbours for the Year Ending March 31, 1954*, Johannesburg, 1955, Statements 27 and 40.

TABLE II

GOODS AND PASSENGER TRAFFIC ON THE LOURENÇO MARQUES RAIL SYSTEM, BY COMPONENT LINES

(Goods in metric tons; passengers in bookings)

Lines and type of traffic	*1938*	*1948*	*1954*
RESSANO GARCIA LINE—Goods traffic	*1,508,981*	*2,402,140*	*2,986,626*
Transit (Union)	1,494,091	2,285,735	2,830,740
Local (Mozambique)	104,890	116,405	155,886
Passenger traffic	193,458	429,905	405,002
GOBA LINE—Goods traffic	*36,907*	*141,707*	*172,755*
Transit (Swaziland)	2,290	7,542	12,259
Local (Mozambique)	34,617	134,165	160,496
Passenger traffic	8,140	39,609	38,232
LIMPOPO LINE*—Goods traffic	*92,325*	*212,518*	*346,323*
Transit	6,342	5,006	6,953
Local (Mozambique)	85,983	207,512	339,370
Passenger traffic	50,009	137,995	186,779
MARRACUENE LINE—Goods traffic	*10,009*	*35,988*	*51,190*
Transit	.....	.....	12,824
Local (Mozambique)	10,009	35,988	38,366
Passenger traffic	97,863	316,403	340,476
Total Transit	1,502,723	2,298,283	2,862,776
Total Local	235,499	494,070	694,118
GRAND TOTAL: GOODS	1,738,222	2,792,353	3,556,894
PASSENGERS	349,470	923,912	970,489

*In 1938 and 1948 of 148 miles, in 1954 of 205 miles.
Sources: 1938, 1948: C.F.M. *Relatório . . . 1938*, pp. 89, 97–102, and *1948*, pp. 106, 115–125.
1954: C.F.M. Administration Records.

inward transit traffic. Other transit imports of some significance are chemicals, machinery and paper.

The importance of petroleum transit traffic is due essentially to the geographic advantages of shorter sea and land hauls from the Persian Gulf to the Transvaal. This traffic has been further encouraged by moderate rail charges, low transit dues of the Portuguese government (1 per cent of value), and efficient handling by the four petroleum marketing companies established at Lourenço Marques. Two recent developments, however, are likely to result in a marked cutback in transit petroleum shipments: full-stream operation of the Standard-Vacuum Oil refinery near Durban; and production of oil from the new SASOL (South African Coal, Oil and Gas Corp., Ltd.) oil-from-coal plant near Coalbrook, 50 miles south of Johannesburg. These two plants aim to satisfy about two-fifths of the total Union gasoline requirements and to manufacture other types of fuels and chemicals. After the Wentworth (Durban) refinery went on stream in 1954 a fall of 80–85 per cent in transit gasoline volume at Lourenço Marques was reported by some distributors.

It is difficult to predict what products will replace petroleum should the imports via Lourenço Marques sink below the agreed percentage in the Mozambique Convention. However, adjustments were successfully made in the past after the Union's fertilizer and cyanide factories reduced transit imports of these commodities.

EXPORTS FROM THE UNION VIA LOURENÇO MARQUES

In 1953–54 Lourenço Marques shipped 1.5 million tons of Union exports, or one-quarter of the total export tonnage handled by the five main outlets used by South Africa. This flow, however, accounted for only 7 per

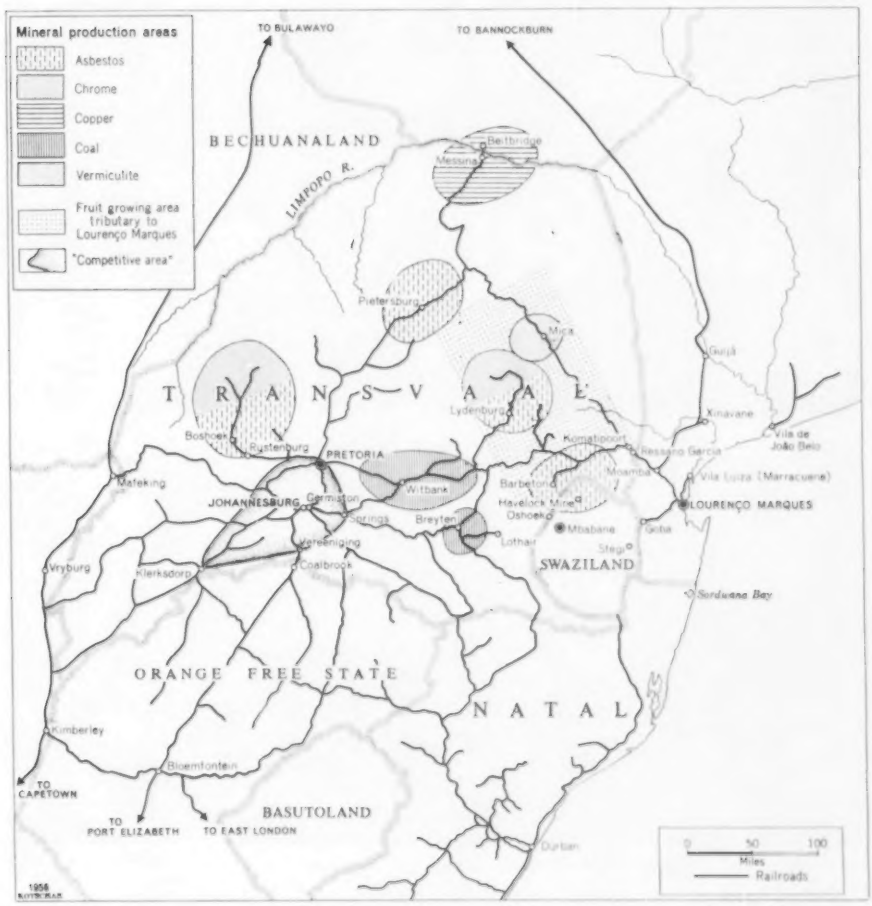

FIG. 9. The Union-Swaziland hinterland of Lourenço Marques and its main production areas.

cent of the value of overseas exports of the Union.

The principal commodities railed from the Union to Delagoa Bay are base minerals, coal and coke, and citrus fruit. In 1954 these products accounted for 95 per cent of transit export volume. Table IV compares the export volume of selected commodities railed to Lourenço Marques with the total Union exports of each in 1954. The Mozambique port is *the* outlet of the Union for chrome ore from the Boshoek-Rustenburg and Lydenburg areas of the Transvaal, for vermiculite mined at Mica, and for mica and corundum. Over half of the asbestos and coal exports also move via Delagoa Bay.

Coal producers in the Union would like to export more coal at the favorable prices that prevail in external markets. But the level of domestic consumption permits shipping only a limited part of the 25–26 million tons of salable coal produced every year. Lourenço Marques ranks ahead of the Union ports

FIG. 10. Union hinterland of Lourenço Marques. Johannesburg, heart of the Rand (British Information Services).

FIG. 11. Swaziland hinterland of Lourenço Marques. A rural road feeding the small regional traffic to extra-territorial railheads. (British Information Services).

in the volume of coal received from the Transvaal for export, for bunkerage, and for coastwise shipment to Union ports.[8] Some Transvaal coal is consumed by the southern Mozambique rail system and by Lourenço Marques. There have been marked fluctuations in the shipments of Transvaal coal via Lourenço Marques, chiefly because of changes in Union transport policies. Most of the coal no longer comes from the main Witbank colliery but from a number of mines in the vicinity and from Breyten.

Half of the Union's acreage under citrus fruit (55,000 acres) is in the

[8] The S.A.R. report for 1953–54 (*op. cit.*, p. 156) lists the following uses of Transvaal coal handled by Lourenço Marques in 1953–54 in short tons:

Bunkered at port	23,833
Exported	518,894
Shipped to Union ports	145,887
Total	688,614

The coastwise trade, which is considered as in-transit traffic, is usually carried by S.A.R.'s own coaling vessels of 5000–7000 tons, which also may take full shiploads of export coal to foreign destinations. Most export coal goes to other African countries and to Asia, though occasional shipments are made to Europe and the Atlantic coast of South America (p. 161).

TABLE III

IMPORTS FOR TRANSVAAL'S COMPETITIVE AREA THROUGH THE UNION PORTS AND LOURENÇO MARQUES

(In short tons)

Ports	*1938*	*1948*	*1954*
Lourenço Marques	n.a.	597,949	709,658
Durban	n.a.	327,893	242,912
East London	n.a.	109,176	125,460
Port Elizabeth	n.a.	103,582	54,905
Cape Town	n.a.	8,080	9,614
TOTAL	528,804	1,146,680	1,142,549
% of Lourenço Marques	52.5	52.2	62.1

Sources: 1938, 1948: C.F.M. *Relatório . . . 1938*, p. 112, and *1948*, p. 77.
1954: C.F.M. Administration Records.

Transvaal, but only about 10 per cent of the yearly crop is exported through Lourenço Marques. The bulk of the citrus trade is handled by the southern Union ports which also handle all trade in deciduous fruit because of their proximity to the growing areas. The cold-storage plant at Lourenço Marques has an estimated excess capacity of 40 per cent, partly justified by the seasonality of this trade. Citrus exports from Lourenço Marques' domestic hinterland, representing 10–12 per cent of the Union citrus shipments, also utilize the same storage and shipping facilities.[9] Most of the citrus fruit from the Transvaal is shipped to Britain in the refrigerated holds of fast Union-Castle liners. Mozambique fruit is shipped to Portugal and other continental countries.

In addition to the transit flow of the Union moving via Lourenço Marques there is some interchange of goods between the two countries handled by the Ressano-Garcia line. Part of this traffic reflects the climatic differences between the two areas, the Union shipping middle-latitude produce (fresh vegetables, potatoes, fruit and wheat, sometimes milled at the new Matola mill), Mozambique shipping such tropical commodities as sugar and bananas. The interchanges also reflect the more advanced industrial status of the Union which sends a variety of manufactured goods to Mozambique. Tariffs and other barriers, however, have kept the level of exchange lower than it might have been. Banana producers in Mozambique have periodically been subjected to import restrictions by the Union, while Mozambique has restricted imports of certain manufactured articles from South Africa in favor of metropolitan Portuguese competitors.

Passenger bookings on the Ressano Garcia line are mainly by African workers going to and from the Rand. Some Portuguese use the railway when traveling to Johannesburg, but air connections are often preferred. Most South African whites proceeding to Lourenço Marques drive via the international highway which also enters Mozambique at Ressano Garcia.

THE SWAZILAND HINTERLAND

The 43-mile Goba rail route from Lourenço Marques to the Swaziland border is fed by a thrice-weekly C.F.M. truck service that operates on a 26-mile route to Stegi. The system of roads in Swaziland permits only the eastern and northwestern parts of the territory to be directly tributary to the Mozambique terminal (Fig. 11). Mbabane, the capital, together with most of the western section and the south, is tributary to the S.A.R. system, which also taps Swaziland traffic with motor service connections.

With an area of only 6700 square miles and a population of about 200,000, Swaziland is in an early stage of eco-

[9] See C. F. Spence: *The Portuguese Colony of Mozambique—An Economic Survey*, A. A. Balkema, Capetown, 1951, pp. 65–66.

TABLE IV

MAIN UNION EXPORTS OVER THE RESSANO GARCIA LINE VERSUS TOTAL UNION EXPORTS OF SAME COMMODITIES, 1954

(In short tons)

Commodities	*Railages to Lourenço Marques*	*Total Union Overseas Exports*
Coal	734,410	1,241,730
Chrome ore	559,971*	487,530*
Asbestos	66,140	127,259
Vermiculite	37,371	38,594
Copper	8,734	45,241
Mica	3,678	4,678
Corundum	1,499	1,521
Citrus fruit	30,211	292,210

*Tonnages of chrome ore railed to Lourenço Marques are sometimes larger than those actually shipped out, only the latter being recorded as exports.

Source: C.F.M. Administration Records.

nomic development,[10] and a large interchange of traffic is not to be expected. However, the output of the famous Havelock asbestos mine that is destined for overseas markets is routed to Lourenço Marques via a cable railway and Barberton railhead. Some hides and skins, wool, peanuts, and wattle bark are also exported through the Mozambique port. Live cattle and butter from Swaziland find ready markets in Lourenço Marques itself. Shipments to Swaziland through Mozambique consist almost exclusively of petroleum products.

Large-scale afforestation by the Colonial Development Corporation and private companies in Swaziland, and a projected paper mill are not likely to increase traffic on the Mozambique lines because the production will be marketed in the Union. Recently-discovered deposits of high-grade iron ore (estimated to contain up to 100 million tons of ore of 64 per cent iron content) may provide some traffic for Lourenço Marques when developed, though most of the output is likely to be shipped to the ISCOR steel mill at Vanderbijl Park (Vereeniging), 35 miles south of Johannesburg. Discovery of the deposit has revived consideration of continuing the Goba rail line into Swaziland as far as the mining site, but, on the other hand, an agreement is reported to be pending between the mining company and S.A.R. involving the construction of a line from Oshoek and the Lothair railhead, west of Mbabane.

[10] The total cash income of African farmers was estimated at only £30,000 in 1953 (U.K. Colonial Office: Colonial Annual Reports: *Swaziland*, 1954, H.M.S.O., London, 1955, p. 17). See also *High Commission Territories: Economic Development and Social Services* (Cmd. 9580), H.M.S.O., London, 1955, 19 pp.

THE NATIONAL HINTERLAND

The Mozambique hinterland of Lourenço Marques may be divided into three parts (Fig. 12). First is the administrative district of Lourenço Marques and a portion of the Gaza district on both sides of the Limpopo River. This area is served directly by the southern Mozambique rail system and by about 500 route-miles of C.F.M. regular and seasonal motor services. It covers approximately 32,000 square miles containing a population of about 500,000.[11] A second division of the national hinterland, poorly connected by land routes with Lourenço Marques, consists of the remainder of the Gaza district beyond the Limpopo River and the Inhambane district, totalling about 132,000 square miles and populated by close to 1 million people. It is reached mainly by coastwise shipping. The third division comprises a string of towns along the coast from the mouth of the Save (Sabi) River to Cape Delgado plus the inland areas they serve. The coastwise shipping upon which these centers are dependent

[11] 440,000 Africans and 42,131 "civilizados," according to the 1950 census. All figures are from Mozambique: Repartição Técnica de Estatística: *Anuário Estatístico 1954*, Imprensa Nacional, Lourenço Marques, 1955, p. 21.

is focussed upon Lourenço Marques as the primary cabotage port.

THE LOURENÇO MARQUES—WESTERN GAZA DIVISION

Domestic rail traffic in this primary tributary area of the port tripled between 1938 and 1954, but the 694,118 tons hauled in 1954 represented only one-fifth of the total rail traffic. Even this figure presents an inflated impression, because it includes 230,718 tons of railway service traffic and 226,318 tons of low remunerative stone-quarry traffic.

Inbound commercial movements include petroleum products, timber, fertilizers for European farms, and some manufactured products from overseas, plus cement, ceramics, tiles, beer, flour, and meal from processing establishments in Lourenço Marques. Movements to the coast consist chiefly of market garden produce from African and Portuguese farms, and a limited volume of agricultural exports. About 25,000 head of cattle a year and some dairy produce also move by rail to the markets of Lourenço Marques. There is no mining in this hinterland, but a fairly heavy tonnage of quarried building stone, limestone, and clay moves on the Goba line.

The most important exports from this area have been plantation sugar and cashew nuts. Sugar exports have declined recently due to the increasing consumption in Mozambique. Cashew nuts, gathered by Africans from natural and planted trees, have long been a staple export.[12] The nuts are normally shipped to India for manual decortication, practiced as a cottage industry by women and children, and then reshipped to the United States. If the mechanical decorticator patented in Lourenço Marques in 1955 proves effective, it may be possible to ship the more valuable shelled nuts directly. Other exports derived from this primary domestic hinterland are limited quantities of citrus fruit, pineapples, cotton, rice, and oilseeds.

The city of Lourenço Marques has been far more attractive to Portuguese immigrants than farming in the rural districts. Only the Incomati Valley between Xinavane and Vila Luiza (Fig. 13), with fertile alluvial soils, an abundant water supply, and easy communications by river, has drawn a sizeable number of European farmers. Both the 21-mile Marracuene branch, now being extended to Manhiça, and the Limpopo branch, i.e., the former 105-mile Moamba to Guijá line with an offshoot to Xinavane, were laid to facilitate the evacuation of produce from this area. A bar at the entrance to the Incomati prevented the region being served by coastwise shipping. The Limpopo branch is now part of the new connection to the Rhodesias. It is planned that the Marracuene branch and the Xinavane sub-branch eventually be linked.

THE EASTERN GAZA—INHAMBANE DIVISION

The western part of this division is thinly populated and not promising for agriculture, partly because of its semiaridity. Local agricultural authorities believe that it could be rendered very suitable for ranching with the provision of permanent watering points. The Lourenço Marques and Gaza districts have the largest cattle populations of Mozambique (a total of about 600,000), but there is an inadequate supply of meat and dairy produce to the capital and other centers. The exploitation of coal deposits in the region may

[12] See C. F. Spence, *op. cit.*, pp. 44–46 and J. de Oliveira Boléo: *Moçambique*, Agência Geral do Ultramar, 1951, pp. 417–419.

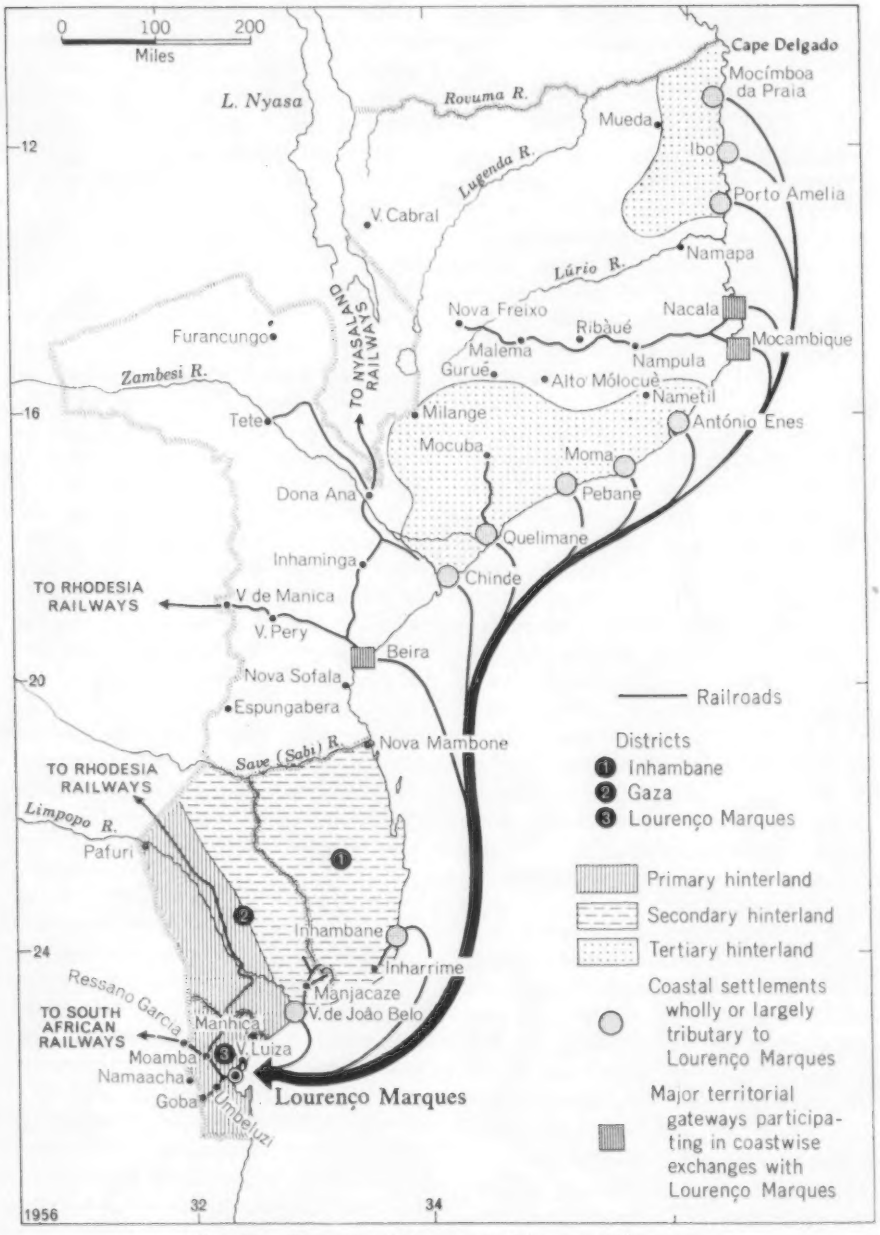

FIG. 12. The national hinterlands of Lourenço Marques.

also be interesting to the railways which prefer coal-burning locomotives to Diesel ones. At present, however, hardly any traffic is derived from the western area, owing to the almost total lack of land communications.

A development that would have permitted opening up part of this region was the projected extension of the Limpopo line from Guijá via Espungabera to Vila Pery on the Beira Railway, which would also have linked by rail the two major cities of the country. This project was shelved when the decision was made to complete the Pafuri Link.

The eastern part of this secondary hinterland is more populous,[13] accessible by sea, and economically more developed. It is from this area that many of the Transvaal's contract laborers are recruited. The two main centers are Vila de João Belo (or Xai Xai) and Inhambane, each being the head of a short rail system.[14] Produce collected and shipped out by the two heads is very diversified and includes cotton, rice, cashew nuts, peanuts, mafurra (*Trichilia emetica*), timber, tobacco, sisal, and maize. Movements by sea to the two secondary ports consist of petroleum products, cement, imported manufactured items, and foodstuffs processed at Lourenço Marques.

Inhambane township has the stronger European community. It was equipped not long ago with a modern pier (Fig. 14) and its total trade reached 40,000 tons in 1954. The harbor of Vila de João Belo, situated well inside the Limpopo mouth, is deteriorating rapidly by deposition of silt in the stream, and its old pier is falling into decay. There is no program to remedy this situation, but it is possible that the road system of the area, now only rudimentary in extent and seasonally closed, will be improved and oriented toward the railheads from Lourenço Marques serving the Limpopo Valley white settlement scheme. This major scheme involves the settling of 6000 immigrant Portuguese families on some 500,000 acres of prepared land to grow wheat for domestic consumption and other crops for sale in Mozambique and abroad. It has been given high priority and large credits under the Portuguese Six-Year Development Plan (1953–1958) for the Portugal and the overseas territories.[15]

THE SAVE RIVER—CAPE DELGADO COASTAL HINTERLAND OF MOZAMBIQUE AND THE PROVINCE'S CABOTAGE TRADE

The main ties of Lourenço Marques with the third tributary area are by coastal vessels. Along the lengthy seaboard of Mozambique only Delagoa Bay, Pungue estuary (Beira harbor), the roadstead of Mozambique Island, Fernão Veloso Bay (Nacala harbor), and the undeveloped bay of Porto Amélia[16] can be entered by average deep-sea ships. The lagunary formations with shallow waters in the south and center, the coral reefs along many parts of the coast, and the seasonally strong southward-flowing Mozambique Current inhibit close-to-shore navigation at other points. Nor would the present level of trade at the lesser centers justify calls by large vessels.

[13] For the distribution of population in Mozambique see map, p. 180, in J. de Oliveira Boléo, *op. cit.*, and Fig. Ia in Glenn T. Trewartha and Wilbur Zelinsky: "Population Patterns in Tropical Africa," *Annals Assn. of Amer. Geogrs.*, Vol. 44, 1954, pp. 135–162.

[14] The Vila de João Belo system has 87 miles of 0.75 m.gauge line; the Inhambane system has 62 miles of 3 ft. 6 in. gauge track. About 20,000 tons of traffic are carried annually on each of the two lines.

[15] See Portugal: Ministérios da Economia e do Ultramar: *Plano do Fomento*, Império Lda, Lisbon, 2 vols., 1953.

[16] For a discussion of Nacala and Porto Amélia see I. S. van Dongen: "Nacala, Newest Mozambique Gateway to Interior Africa," *Tijdschrift Voor Economische en Sociale Geografie*, 48th year, 1957, No. 3, pp. 65–72.

FIG. 13. Domestic primary hinterland of Lourenço Marques. European-grown sugar cane in the Incomati Valley (Repartição Técnica de Estatística).

Eleven Portuguese ships of up to 7000 GRT operate regularly in the cabotage trade of Mozambique.[17] These ships carried 263,611 tons of coastwise cargo in 1953.[18] A Dutch line carried 33,000 tons of cabotage traffic in the same year, while sailing craft operated by Africans and Portuguese moved irregularly between Lourenço Marques and lesser points along the coast.

A portion of this traffic destined for oversea export is transshipped either at Beira or Lourenço Marques, the two ports handling about equal tonnages of such goods. Exports which are in need of processing prior to shipment go overwhelmingly to Lourenço Marques; overseas imports tend also to be brought in and distributed through the Delagoa Bay terminal. Moreover, Lourenço Marques draws a considerably higher tonnage of domestic interchanges than Beira, because of its greater processing facilities and its status as the leading consuming center of the territory.

The normal points of call of coastal vessels moving northward beyond the Save River estuary are Beira, Chinde, Quelimane, Pebane, Moma, António Enes, Mozambique Island, sometimes Nacala, Porto Amélia, Ibo, and Mocímboa da Praia.

Commodities moving to and from Lourenço Marques in cabotage movements are similar to those figuring in traffic with Inhambane and João Belo. Among the secondary ports, Quelimane stands out as an outlet of a fertile copra-and-tea producing region. It is the terminus of an 87-mile rail line supplemented by over 1200 route-miles of C.F.M. motor services. In 1954 the port's trade was 111,692 tons and the volume of traffic on its rail line was 115,000 tons.

In addition to brisk goods traffic along the Mozambique seaboard, the poor quality of roads and the absence of rail interconnections makes for a sizeable passenger trade in coastal vessels. The inclusion of many of the lesser territorial European nuclei in the air network of D.E.T.A. (Divisão dos Transportes Aéreos) in recent years, has not as yet greatly reduced the number of Portuguese proceeding to their destinations by sea.

THE RHODESIAN HINTERLAND

The Bannockburn-Guijá rail link, which has tied Lourenço Marques with the Rhodesian Railways, giving it a vastly expanded extra-national hinterland, was selected as the most desirable among three possible routes to relieve congestion on the Rhodesian lines and at the port of Beira.[19] The line was constructed in record time at a cost of £14.5 million and opened to traffic

[17] These are owned and operated by the two Portuguese lines (Companhia Nacional de Navegação and Companhia Colonial de Navegação) that ensure the long-distance sea connection between Mozambique and Portugal.

[18] J. M. Rato: "Moçambique e o plano de renovação da Marinha Mercante," *Boletim da Junta Nacional da Marinha Mercante*, Sept. 1955, p. 81.

[19] See preliminary survey by Knappen-Tippetts-Abbett Engineering Co.: Alternative Port and Rail Facilities in Mozambique and Southern Rhodesia—A Report to the Government of Portugal and the Government of Southern Rhodesia, New York, January 1952, 86 pp.

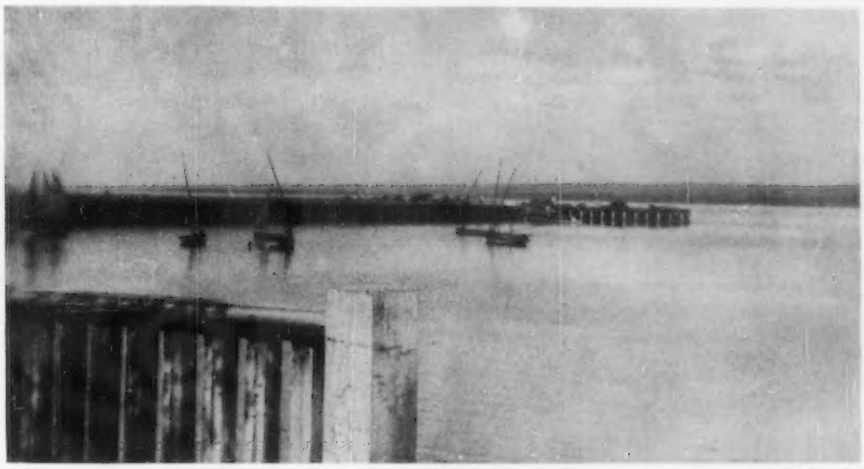

FIG. 14. Coastwise connections in Lourenço Marques national hinterland. New C.F.M. pier at the secondary port of Inhambane (Luiz de Vasconcellos).

in August, 1955. It makes possible savings of as much as ten days in shipments to and from Northern Rhodesia and is well placed for some important exports from Southern Rhodesia.

Various estimates were made of the increase in traffic that might be expected at Delagoa Bay as a result of this new link. The Knappen report suggested that 1.1 million short tons would flow to and from the Rhodesian hinterland in the first year, giving the port an additional income of $2.5 million, and that in the tenth year 2.2 million tons would move on the line, yielding $4.5 million to the port.

The initial expectations have not been achieved in the first year, partly because of the time needed to effect the multiple operational adjustments required. One year after the official inauguration, train frequency on the line is only two goods-trains a day in each direction. Mineral shipments from the Copperbelt and asbestos from the Shabani mines in Southern Rhodesia have thus far been the main outgoing commodities, and petroleum the chief item moving inland. It is doubtful whether some of the traffic which the report expected to be rerouted via Lourenço Marques will be, notably copper from the Belgian Katanga, because of shipping agreements made by Union Minière at Beira.[20]

The potential traffic offering would, of course, cover almost the whole range of commodities produced and consumed in the two Rhodesias. The new line should also stimulate economic activity in the previously undeveloped area of southeastern Southern Rhodesia through which it passes. The resulting traffic could include coal from deposits in the Lundi Valley, output of a planned £20 million citrus development,[21] and livestock products from extension of ranching operations.

The most important effect of the new link to date has been the strengthened position of Delagoa Bay as an international ocean terminal and the

[20] See W. A. Hance and I. S. van Dongen, "Beira, . . . ," *op. cit.*

[21] "£20,000,000 Citrus industry for Rhodesia," *African World*, July 1956, p. 21.

reduced dependence on the somewhat uncertain good will of the Union. Transport interests in the Union did not look favorably upon the Pafuri link, for they had hoped to tap the Rhodesian traffic by closing the 100-mile gap between West Nicholson and Beitbridge. The capacity of the existing Union-Rhodesia link through Bechuanaland has never been great, partly because of the handicaps of operation in arid country. Difficult and protracted negotiations regarding freight rates and port charges preceded the opening of the new Limpopo route, because cargo handling charges at Lourenço Marques were tied to some extent by the Mozambique Convention to the port charges at Union terminals.[22] Recently talk has been revived in the Union of building a national coaling port at Sordwana Bay to bypass Lourenço Marques in the shipments of Transvaal coal.[23] Should this threat to Delagoa Bay trade materialize the Rhodesian traffic flow would be a welcome substitute, particularly because of physical similarities in the nature of traffic.

CONCLUSION

The port of Lourenço Marques at the head of Delagoa Bay is a leading terminal of the eastern African coast. Its natural site features and modern port facilities equip it well to handle the trade of the hinterlands it serves. Potential traffic flow from its chief tributary area, the Transvaal, has been somewhat restricted by policies of the Union designed to favor the more distant national outlets. But the Mozambique Convention, the desire of a speedier transport for mineral shipments, and the post-war congestion on the South African Railways have meant that Lourenço Marques continues to function as one of the chief gateways of the Union.

The level of national trade through the southern Mozambique terminal largely reflects the insufficiently developed character of agricultural activities in the domestic primary and secondary hinterlands. Development in the Lourenço Marques region has been heavily concentrated on urban and industrial growth, but such projects as the Incomati and Limpopo Settlement Schemes may give a more rounded character to the economy of that section of Mozambique and increase the amount of local export traffic.

It is too early to determine the share of Rhodesian trade that will be handled by the port. However, the rapidity of growth in the Rhodesias suggests that this trade will expand greatly in the coming years. Thus the Delagoa Bay terminal should continue, at least in the near future, to derive the largest portion of its income by handling transit traffic to and from the more highly productive areas of its extra-national hinterland rather than from further development of resources in the domestic tributary areas.

[22] Port handling charges at Lourenço Marques have been *ad valorem* whereas Beira has maintained fixed commodity rates. For the copper producers of Northern Rhodesia a change from Beira to Lourenço Marques would have meant a considerable additional expenditure at the time when high prices prevailed. Yet the Union did not desire to see a change in the rating system of Lourenço Marques because it advantaged the southern Mozambique terminal by comparison with its own seaports. To satisfy both British Central Africa and the Union a dual system of port charges had to be introduced.

[23] "New Coal Exporting Harbor Planned," *South African Exporter*, Dec. 1955, p. 29.

SOME GEOGRAPHIC ASPECTS OF INTERNATIONAL TRADE

Andreas and Lois Grotewold

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THIS paper presents a world view of certain geographic features of international trade. More specifically, three aspects of the world's trade are discussed; namely, (1) the size of international trade and its geographic distribution, (2) the commodity composition of international trade, and (3) the direction of international trade. The paper attempts to supply a few basic generalizations in an enormously wide and interesting field which has been cultivated comparatively little by geographers in recent years.[1]

Size of International Trade

The most commonly used measures for international trade are national exports and imports. Through the efforts of the United Nations, comparable data for exports and imports have been made available for nearly all parts of the world. Some of the units for which such data are reported are sovereign countries or nations. Others are political dependencies. Still others are of somewhat indeterminate status, such as Formosa and South Korea. In some cases, areas ordinarily thought of as separate units are lumped under one heading. Data for the United States, for example, include Alaska, Hawaii, and Puerto Rico. Data for Spain include the Canary Islands. Belgium-Luxembourg is considered one unit, and the same is true of Malaya-Singapore, and Ethiopia-Eritrea. Thus, areas for which trade statistics are reported do not always coincide with what is commonly called a country or nation. Therefore, the term "trade report unit" is sometimes used in the following pages to denote any unit for which trade statistics are reported.[2] These are designated by the name which they held during 1952 and 1953, the period to which the trade statistics refer.

In several cases, the exports of a trade report unit were considerably larger than the imports, or *vice versa*. In 1953, for example, the value of exports from the United States amounted to 15.7 billion dollars, whereas our imports were only 10.9 billion dollars.[3] On the other hand, Canada's imports totaled 4.5 billion dollars, whereas her exports amounted to only 4.2 billion

[1] Since the end of World War II, many useful data on which to base studies of international trade have been accumulating. These have been used in numerous publications by United Nations agencies, and in the volume by Wladimir S. Woytinsky and E. S. Woytinsky, *World Commerce and Governments, Trends and Outlook* (New York: The Twentieth Century Fund, 1955).

[2] Areal definitions used by the United Nations for statistical purposes are described in U. N. Statistical Office, *Nomenclature of Geographic Areas for Statistical Purposes*, Statistical Papers, Series M, No. 1 (New York: 1949).

[3] A large part of the discrepancy between United States exports and imports is due to our economic aid programs. See U. S. Department of State, *Partners in World Trade: The Goal of the G A T T*, Commercial Policy Series No. 148 (Washington: Government Printing Office, 1955).

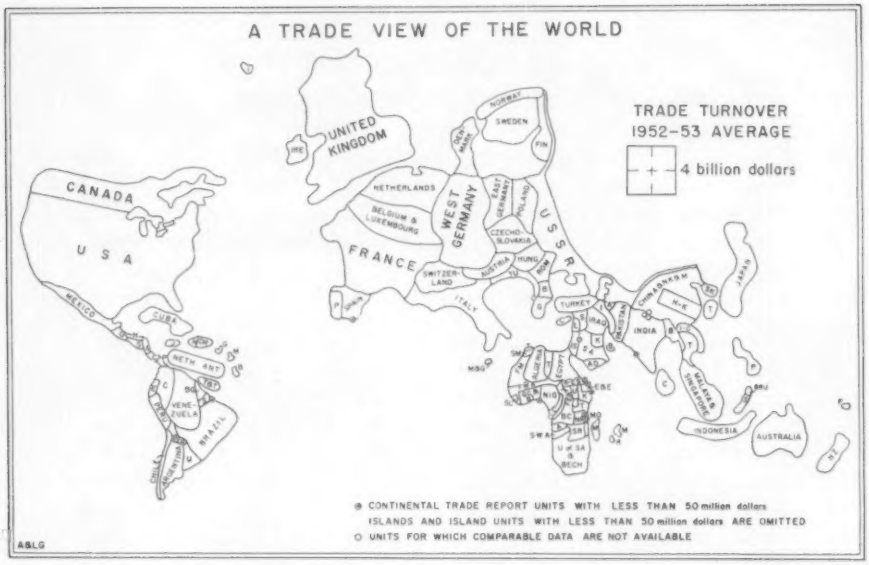

FIG. 1.

dollars.[4] Obviously both measures, exports and imports, are basic to the study of trade. If only one were selected, the comparative size of trade would be exaggerated for some units and would be disproportionately low for others. Therefore, in this paper the sum of exports plus imports, the "trade turnover," has been utilized to compare different units as to the size of their foreign trade.

Figure 1 shows trade report units proportional in size to their average trade turnover during 1952–53.[5] The industrial countries bordering either side of the North Atlantic are impressively large. Clearly these are the major trading blocs. Trade units become smaller toward southern and eastern Europe. Asia, Africa, and South America appear merely as appendages within which only a few units like Japan, Malaya-Singapore, the Union of South Africa (including Bechuanaland), Venezuela, and the Netherlands Antilles seem to be really outstanding. Africa's total trade turnover was less than half as large as that of the United States, and Latin America's less than the United Kingdom's.

To the world's total trade turnover of some 166 billion dollars,[6] Europe

[4] Data from U. N. Statistical Office, *Direction of International Trade*, Statistical Papers, Series T, Vol. V, No. 8 (New York: 1954). Exports f.o.b., imports f.o.b.

[5] Data *ibid.*; and from U. N. Statistical Office, *Statistical Yearbook: 1954* and *1955* (New York: 1954 and 1955); U. N. Statistical Office, *Yearbook of International Trade Statistics: 1953* and *1954* (New York: 1954 and 1955); for units behind the Iron Curtain from U. N. Economic Commission for Europe, *Economic Survey of Europe in 1954* (Geneva: 1955). Exports f.o.b., imports c.i.f. Several of the data used in the construction of Figure 1 were listed as derived figures. In some cases, such as Argentina and Paraguay, a large number of derived figures were added to determine the total trade turnover. A high degree of accuracy cannot be claimed for all data. The information was adequate, however, for the construction of the cartogram (Fig. 1), and the general impression which it conveys is correct.

[6] This figure includes the trade of all units for which data were available. The only areas for which reasonably comparable data could not be obtained, and which therefore are not included, are Albania, Spanish Sahara, Spanish Guinea, Tibet, Nepal, and Bhutan.

and the Soviet Union contributed 45.0 per cent, Anglo-America 21.1 per cent, Asia (excluding the Soviet Union) 14.4 per cent, Latin America 9.8 per cent, Africa 6.7 per cent, and Oceania 3.0 per cent. The shares of the six largest traders were as follows: United States 15.9 per cent of the world's total, United Kingdom 10.3 per cent, France 5.3 per cent, Canada 5.2 per cent, West Germany 4.9 per cent, and the Soviet Union 3.3 per cent.[7]

There were 114 trade report units with a trade turnover of 50 million dollars or more, and 45 units with a trade turnover of less than that.[8] The combined trade turnover of the latter accounted for only 0.54 per cent of the world's total. They were too small to appear on Figure 1 proportional to the size of their trade. If they were located on continents they are marked by a circled dot; if they consisted of islands they are not shown at all.

In the following parts of this paper, only the 114 trade report units with a trade turnover of 50 million dollars or more are considered.

COMMODITY COMPOSITION

As areas differ greatly in the size of their international trade, so they differ in the commodity composition of their trade. Differences in the latter, however, are somewhat more difficult to measure, especially since reports of commodities are based on different classifications. The Standard International Trade Classification (S I T C),[9] developed and recommended by the United Nations, is employed by only 33 countries. Other units report their data according to "principal commodities," and these vary somewhat in definition. Therefore, detailed comparisons on a world-wide scale cannot be made. The data that are available, however, permit some interesting illustrations.

The export lists of the world's largest traders, especially the industrialized countries bordering the North Atlantic and Japan, show a large number of commodities derived from a great variety of raw materials. This contrasts sharply with the export lists of most small trade report units. The exports of the latter are often very specialized. Only one raw material and its immediate derivatives may contribute a very large share to the value of their total exports.

Figure 2 shows the relative dependence of exports on a single raw material during 1952–53.[10] None of the very

[7] According to *The New York Times*, April 15, 1956, this order has changed. In 1954, West Germany was the world's third largest trader, followed by France, Canada, and the Soviet Union.

[8] These trade report units are Greenland, St. Pierre and Miquelon, the Bahamas, Bermudas, British Honduras, the Falkland Is., French Guiana, the Leeward Is., Virgin Is., Windward Is., British Somaliland, the Cape Verde Is., French Somaliland, Gambia, Liberia, Libya, Nyasaland, Portuguese Guinea, St. Helena, São Tomé and Principe, the Seychelles, Italian Somaliland, the Comoro Is., Zanzibar, British North Borneo, Jordan, Macao, Portuguese India, American Samoa, French Oceania, Guam, Nauru, New Caledonia, the Territory of New Guinea, Papua, Netherlands New Guinea, the New Hebrides, Tonga, Western Samoa, Portuguese Timor, the British Solomon Is., the Ryukyu Is., French India (which no longer exists), the Faeroe Is., and Gibraltar.

[9] Detailed definitions of S I T C commodity groups are given in U. N. Statistical Office, *Standard International Trade Classification*, Statistical Papers, Series M, No. 10, 2d ed. (New York: 1951).

[10] For most trade report units, the composition of exports and imports is listed in the *Yearbook of International Trade Statistics: 1953* and *1954*, *op. cit.* Data for East Germany from *Economic Survey of Europe in 1954*, *op. cit.*; for Martinique, Uganda, and Iraq from *Britannica Book of the Year, 1955* (Chicago: Encyclopaedia Britannica, 1955); for Saudi Arabia, Kuwait, and Bahrein from Royal Institute of International Affairs, *The Middle East: A Political and Economic Survey*, 2d ed. (London: Royal Institute of International Affairs, 1954); for South Korea from The Bank of Korea, *Monthly Statistical Review*, No. 79, June 1955 (Seoul: The Bank of Korea, 1955); for Barbados

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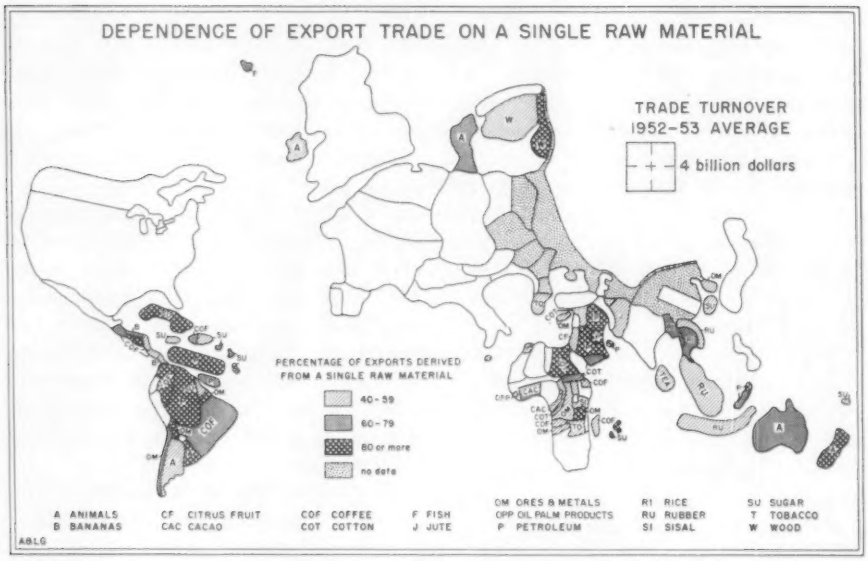

FIG. 2.

large traders derived as much as 40 per cent of its total exports from one single raw material. The exports of many small trade report units, however, were quite specialized. Some of them had 80 per cent or more of their total exports based on a single raw material. The various kinds of raw materials are differentiated in the legend.[11]

Sugar appears most frequently as a raw material basic to a large share of total exports, followed by coffee, petroleum, and ores and metals. Sugar was the major export commodity of most West Indian islands, British Guiana, Mauritius, Reunion, Formosa, and the Fiji Islands. Exports from most Central American republics, Haiti, Colombia, Brazil, Ethiopia-Eritrea, Angola, and Madagascar were largely dependent on coffee. Petroleum was basic to a sizable share of total exports from Venezuela, the Netherlands Antilles, Trinidad and Tobago, Iraq, Saudi Arabia, Kuwait, Bahrein, Brunei, and Sarawak.[12] Exports from Chile, Bolivia, Surinam, Cyprus, the Belgian Congo, Northern Rhodesia, South-West Africa,

from Colonial Office, *Report on Barbados for the Years 1952 and 1953* (London: Her Majesty's Stationery Office, 1954); for Kenya from Colonial Office, *Report on the Colony and Protectorate of Kenya for the Year 1954* (London: Her Majesty's Stationery Office, 1955); for the Fiji Islands from Colonial Office, *Report on Fiji for the Year 1954* (London: Her Majesty's Stationery Office, 1955); for South-West Africa by courtesy of the Consulate General of the Union of South Africa, New York. For some units, data were not available for 1952 and 1953. In such instances, data for 1951 or 1954 were used to calculate a two-year average.

[11] Some of the raw material headings are more inclusive than may appear desirable for a comparison of the degree of specialization. In the case of animals, a further differentiation could not be introduced, because some items listed in statistical reports may have originated from various kinds of animals, and therefore could not be allotted to either sheep, cattle, or hogs. Ores and various kinds of metals were lumped under one heading because it was not possible to determine to what extent the same body of ores may account for the several metals that were exported.

[12] Following the nationalization of the Iranian oil industry in 1951, petroleum production in that country ceased almost completely. During 1952–53, petroleum did not contribute as much as 40 per cent to the exports of Iran. More recently, however, Iranian petroleum production has increased once more.

and South Korea depended primarily on ores and metals.

Among the other raw materials which contributed 40 per cent or more to the total exports of some units were cotton, animals, rubber, cacao, bananas, rice, tobacco, wood, citrus fruit, oil palm products, tea, jute, sisal, and fish. Cotton was the major export of Egypt, the Anglo-Egyptian Sudan, Uganda, French Equatorial Africa, Aden, and Syria. Exports from Argentina, Uruguay, Ireland, Denmark, Australia, and New Zealand consisted primarily of animals and animal products. A large share of the exports from Indochina, Malaya-Singapore, and Indonesia were derived from rubber. Cacao was the major export from the Gold Coast (including British Togoland) and the French Cameroons. The two Central American republics whose exports did not consist primarily of coffee, namely Honduras and Panama, derived most of their exports from bananas. Rice was the major export from Burma and Thailand, and tobacco was the largest export commodity of Greece and Southern Rhodesia. Two countries of northern Europe, namely Finland and Sweden, had the largest shares of their exports based on wood. Six raw materials were represented by one unit each; they included citrus fruit (Israel), oil palm products (Sierra Leone), tea (Ceylon), jute (Pakistan), sisal (Tanganyika), and fish (Iceland).

It is interesting to note that one-third of the most specialized traders, those dependent for 80 per cent or more of their total exports, were dependent on petroleum.

A general relationship between the size of trade report units and the dependence of their exports on a single raw material is quite apparent. A close inspection of Figure 2, however, reveals that this relationship is not consistent. There are several small trade report units, like Mozambique, Lebanon, Ecuador, or Paraguay, which did not have as much as 40 per cent of their total exports based on a single raw material. On the other hand, there are some rather sizable traders, such as Venezuela, the Netherlands Antilles, Cuba, Finland, or New Zealand, whose exports were very specialized.

The share of total exports derived from a single raw material is a good measure for commodity specialization in international trade. Moreover, considering the poor comparability of commodity trade statistics, it is probably the one measure for which the available data are most nearly adequate. However, it is only one possible measure for the commodity composition of international trade. It does not indicate the extent to which appreciable exports of manufactured goods are restricted to a few large traders. By definition it is concerned only with the one raw material which appears largest on the export list. Therefore, it does not measure fully the importance of raw materials in general to the export trade of small trade report units. Ecuador and the Philippines, for example, do not appear on Figure 2 as greatly specialized in the export of only one raw material. However, only a few raw materials, including bananas, coffee, cacao, rice, petroleum, wood, and castor seeds, accounted for practically all of the exports from Ecuador. Some 95 per cent of the exports from the Philippines consisted of coconuts, sugar, abaca, wood, pineapples, and tobacco; not all of the remaining 5 per cent were manufactured goods.

DIRECTION OF INTERNATIONAL TRADE

The directions in which international trade moves throughout the world are very numerous. Small trade report

units carry on some trade with at least a dozen different partners. The world's largest traders, such as the industrialized countries bordering the North Atlantic, entertain trade relations with over a hundred units in all parts of the world.[13] To deal with all these trade relations is beyond the scope of this paper. Only the most important ones are considered. The importance of trade relations can be measured in several different ways.

(1) *Volume of Trade.* Trade relations may be examined in terms of the value of goods which passes from one unit to another. The value of exports which one unit (A) ships to another unit (B) plus the value of imports which the former (A) receives from the other unit (B) is called the "volume of trade" between those two units.

Measured in terms of the volume of trade, the trade relation between the United States and Canada is by far the most important in the world. During 1952–53, the annual volume of trade between these two countries amounted to over 5 billion dollars.[14] The trade partners which ranked second were the Soviet Union and China with a trade volume of 1.6 billion dollars,[15] or less than one-third the volume between Canada and the United States. Other important trade relations based on a volume of more than 1 billion dollars existed between the United States and Brazil, the United States and Mexico, the United States and Japan, the United States and the United Kingdom, the United Kingdom and Australia, and between the United Kingdom and Canada.

[13] Even during the most critical period of the Cold War, in 1951, the United States received imports from all countries behind the Iron Curtain, except from China and Albania. See *Direction of International Trade, op. cit.*

[14] *Ibid.*

[15] *Economic Survey of Europe in 1954, op. cit.*

Trade relations based on a volume of 1 billion dollars or more involve an enormous amount of money and goods. However, they are important to the world's major traders only. Trade relations of smaller units are based on much smaller trade flows. In fact, of the 114 trade report units here considered, only 35 had a total trade turnover of 1 billion dollars or more, and 79 had a trade turnover of less than that. Therefore, trade relations important to smaller units must be measured in some other way.

(2) *Dependence on Trade Partners.* A second measure for the importance of trade relations may be obtained by noting the dependence of one trade report unit (A) on the exchange of goods with another (B). Such dependence can be evaluated in terms of the percentage which the latter unit (B) contributes to the trade turnover of the first (A).

Figure 3 shows the relative dependence of international trade on the exchange of goods with only one trade partner.[16] Neither the United States nor any one of the large traders of northwestern Europe or Japan was dependent for as much as 40 per cent of its trade turnover on any single unit. However, the trade of many small units, and of Canada also, appears to have been closely tied to that of other traders. The names of partners with whom most of this trade was conducted appear in the legend.

Of those units depending on a single other unit for 40 per cent or more of

[16] Data from *Direction of International Trade, op. cit.*, or *Yearbook of International Trade Statistics: 1953* and *1954, op. cit.;* for units behind the Iron Curtain from *Economic Survey of Europe in 1954, op. cit.;* for South Korea from *Monthly Statistical Review*, No. 79, *op. cit.;* for Martinique from *Britannica Book of the Year, 1955, op. cit.;* for Barbados and the Fiji Islands from *Whitaker's Almanac for the Year 1954*, complete ed. (London: 1954).

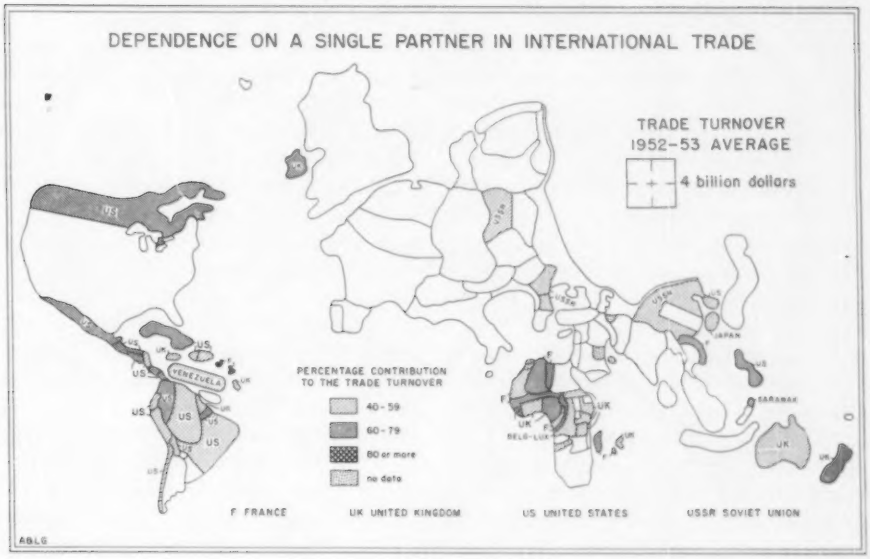

FIG. 3.

their trade turnover, most conducted their trade with either the United States, the United Kingdom, France, or the Soviet Union. In the Americas one finds that the trade of Canada, Mexico, Cuba, Guatemala, Honduras, El Salvador, Costa Rica, Panama, Colombia, and Surinam depended most heavily on the United States. Strong trade relations with the United States existed also for Nicaragua, Haiti, the Dominican Republic, Ecuador, Peru, Chile, Bolivia, Brazil, and Venezuela.[17] Outside the western hemisphere, only the Philippines and South Korea were dependent on the United States for a large share of their trade.

The United Kingdom contributed 40 per cent or more to the trade turnover of some 13 units. Of those, eight were located in Africa; they included Sierra Leone, the Gold Coast (including British Togoland), Nigeria, the Anglo-Egyptian Sudan, Kenya, Tanganyika, Northern Rhodesia, and Mauritius. In the western hemisphere, only two units, Jamaica and Barbados, were dependent for the largest share of their trade on the United Kingdom. The three remaining units whose trade was closely tied to the United Kingdom are Ireland, Australia, and New Zealand. Every trade report unit conducting 40 per cent or more of its trade with the United Kingdom was a member of the British Commonwealth, with the exception of Ireland which left the Commonwealth in 1949. Several important Commonwealth nations, such as India, Malaya-Singapore, the Union of South Africa, and Canada, however, were not dependent on the United Kingdom for as much as 40 per cent of their trade turnover.

[17] In recent years, the United States was the largest trade partner even to Argentina and Uruguay. Reasons for the strong position of the United States in Latin America's trade, and the prospects for diverting a larger share of Latin America's trade to Europe, are discussed in U. N. Economic Commission for Latin America, U. N. Economic Commission for Europe, and Food and Agricultural Organization of the U. N., *A Study of Trade between Latin America and Europe* (Geneva: 1953).

Trade with France contributed at least 40 per cent to the trade turnover of each of the members of the French Union. Some nine units, including Algeria, Tunisia, Madagascar, French West Africa, French Equatorial Africa, Indochina, Reunion, Guadeloupe, and Martinique, depended on France for more than 60 per cent of their trade; two of these, Guadeloupe and Martinique, conducted more than 80 per cent of their trade with France.

The Soviet Union was the largest trade partner to each of the units behind the Iron Curtain. To China (including North Korea and Mongolia), East Germany, Romania, and Bulgaria, trade with the Soviet Union represented between 40 and 59 per cent of their trade turnover. Poland, Czechoslovakia, and Hungary were somewhat less dependent on the Soviet Union. All units behind the Iron Curtain traded primarily within the Soviet bloc.[18]

Only four trade report units depending for 40 per cent or more of their trade turnover on any other single unit did not conduct most of their trade with the United States, the United Kingdom, France, or the Soviet Union. The Netherlands Antilles were most closely linked to Venezuela, and Brunei to Sarawak. In both cases the bulk of the trade was in petroleum. The refineries in the Netherlands Antilles received their crude petroleum from Venezuela. Much of Brunei's petroleum was piped to Sarawak and shipped overseas from there. The Belgian Congo depended on Belgium-Luxembourg for more than 40 per cent of its trade. Formosa's trade was oriented primarily toward Japan.

A general relationship between the size of trade report units and their specialization is apparent, with regard to the direction of trade as well as the commodity composition (c.f., Figs. 2 and 3). In neither instance, however, is this relationship consistent. Figure 3 shows many small traders not dependent on a single trade partner for even 40 per cent of their trade. On the other hand, Canada, the world's fourth largest trader, depended for more than 60 per cent of its trade on the United States.

Among the many units not especially dependent on a single trade partner are the major industrial countries bordering the North Atlantic. Each of these countries entertains trade relations with over a hundred different partners. As an illustration of their diversified trade relations, the United States, the world's largest trader, has been selected.

Figure 4 shows the percentage contribution to the trade turnover of the United States for all units that contributed more than 1 per cent.[19] Canada appears as the largest trade partner of the United States, having contributed almost one-fifth to our total trade turnover—or four times as much as any other unit. Close trade relations existed also between the United States and western Europe. In Europe, the United Kingdom was our largest trade partner, followed by France and West Germany, and then by the Netherlands, Belgium-Luxembourg, Switzerland, and Italy. Turning back to the western

[18] According to *The New York Times*, April 15, 1956, it appears probable that during 1955 the Soviet-dominated countries of eastern Europe had a considerable expansion of their trade with countries west of the Iron Curtain, while trade among themselves increased very little. In 1956, the Soviet government made attempts to increase trade between the Soviet bloc and western Europe; *ibid.*, April 29, 1956. For a discussion of the obstacles encountered in the expansion of such trade see International Cooperation Administration, *Soviet Deterrents to Increased Foreign Trade: Mutual Defense Assistance Control Act of 1951*, 7th Report to Congress, First Half of 1955 (Washington: Government Printing Office, 1956).

[19] Data from *Direction of International Trade*, *op. cit.* Exports f.o.b., imports f.o.b.

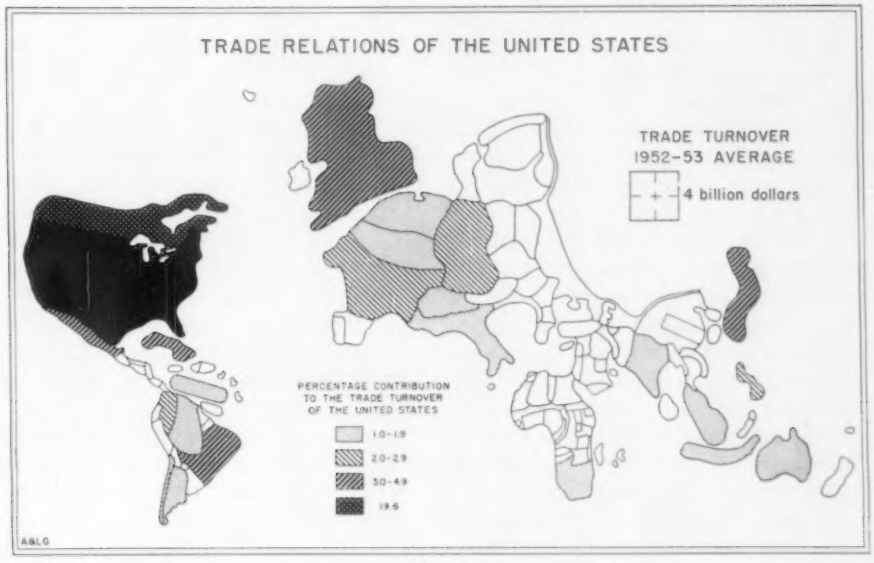

FIG. 4.

hemisphere, one finds several Latin American units that were of considerable importance to the foreign trade of the United States. Mexico, Cuba, and Brazil ranked about as high as the United Kingdom in their percentage contribution. They were followed by Colombia, and then by Venezuela, the Netherlands Antilles, Argentina, and Chile. Across the Pacific, Japan was our largest trade partner. The Philippines accounted for a noteworthy share of our foreign trade also. Malaya-Singapore, Indonesia, Australia, India, and the Union of South Africa (including Bechuanaland) were about as important to our foreign trade as the Netherlands, Belgium-Luxembourg, Switzerland, Italy, the Netherlands Antilles, Venezuela, Argentina, or Chile.

Each of 23 units contributed 1 per cent or more to the trade turnover of the United States. These may be considered our major trade partners. Nearly one-third of the United States foreign trade, however, was carried on with a large number of other partners that do not appear on Figure 4.

By comparing Figures 3 and 4, one notes that many units to which the United States was a very important trade partner were relatively less important trade partners to the United States. Canada, for example, depended for about two-thirds of her trade turnover on the United States, whereas to the trade turnover of the United States she contributed less than one-fifth. More striking examples are found in the Central American countries, and Haiti, the Dominican Republic, Ecuador, Peru, Bolivia, Surinam, and South Korea. Some of these depended for over 60 per cent and all of them for over 40 per cent of their trade turnover on the United States. But not one of these small traders contributed even as much as 1 per cent to the trade turnover of the United States.

SUMMARY

In recent years, North America and Europe (including the Soviet Union)

have accounted for two-thirds of the world's international trade. In South America, Asia, and Africa, only a few trade report units, such as Brazil, Venezuela, China, Japan, Malaya-Singapore, India, and the Union of South Africa have stood out as sizable traders.

A general relationship is apparent between the size of trade report units and the dependence of their exports on a single raw material. A similar relationship exists between the size of units and their dependence on a single trade partner. In both cases the smaller units tend to have the greatest dependence. None of these relationships, however, are entirely consistent.

Nearly all trade report units dependent on a single partner for 40 per cent or more of their trade direct that trade to one of the following: the United States, the United Kingdom, France, or the Soviet Union. None of these four countries, however, is dependent on a single partner for a similarly large share of its trade. Some small units dependent on the United States for over 60 per cent of their trade contribute less than 1 per cent to the trade of the latter country.

Large traders such as the United States and other industrial countries show considerable diversity, and small traders show considerable specialization, both in the direction and the commodity composition of their international trade.

MAN'S ROLE IN CHANGING THE FACE OF THE EARTH

A REVIEW[1]

Preston E. James

Dr. James is chairman of the Department of Geography, Syracuse University.

SCHOLARS in a wide variety of fields may now well pause to read and digest the contents of an extraordinary new book. *Man's Role in Changing the Face of the Earth* is the product of many minds ranging widely across many fields of learning. "Much is to be learned from the study of the edges of things," writes one contributor. Seldom if ever has the attention of so many different specialists been focused on the edges of things, and seldom have the results been more impressive.

We are indebted to the Wenner-Gren Foundation for Anthropological Research for organizing the symposium and for the preparation of the resulting volume, and to the National Science Foundation for aid in the publication. William L. Thomas, Jr., assistant director of the Wenner-Gren Foundation, was the originator of the idea, and contributed an outstanding performance as editor. The three leaders of the symposium were Carl O. Sauer, Professor of Geography at the University of California; Marston Bates, Professor of Zoology at the University of Michigan; and Lewis Mumford, Professor of City and Land Planning at the University of Pennsylvania.

[1] *Man's Role in Changing the Face of the Earth*, William L. Thomas, Jr., Edit. xxxviii and 1193 pp.; maps, diagrs., ills., index. Published for the Wenner-Gren Foundation for Anthropological Research and the National Science Foundation by the University of Chicago Press, Chicago, 1956. $12.50. 10 x 6¾ inches.

The symposium itself was held on June 16 to 22, 1955, at Princeton University. Nearly three years of preliminary planning and research preceded the meeting at Princeton. The basic question to be explored was "What has been, and is, happening to the earth's surface as a result of man's having been on it for a long time, increasing in numbers and skills unevenly, at different places and times?" Fifty-three background papers were prepared, each evaluating the state of knowledge concerning some aspect of the general problem. Of these, 47 were received in time to be printed and distributed in advance to the participants. The symposium itself was organized loosely in order to give the discussion a chance "to rise above the level of the content of the papers into the realm of ideas." It was divided into three parts—Retrospect, Process, and Prospect—and these divisions were also used in the published volume. The symposium was attended by 70 invited scholars, including, in addition to those from the United States, at least one each from England, Scotland, France, Belgium, Germany, Israel, Egypt, and India.

Within the space available for this review it would not be possible to do more than hint at the amazing range of subjects covered by the background papers and the discussions. It seems that man originated some million years ago during the late Pliocene, and was

confined for most of his time on earth to the tropical and subtropical belt between central Africa and southeast Asia. Suddenly, some 50 thousand years ago, man spread rapidly from his original habitat. In only a few thousand years he had moved northward into Europe, and he had crossed into America, even reaching the end of Patagonia. On the way he learned how to plant crops and use domesticated animals. But he also made profound changes in the various habitats he entered, chiefly through the use of fire. From time to time he made sudden advances in his way of living, as when the great irrigation societies provided for the support of city-people. But the greatest of all the revolutions in human culture is the one that is still going on—the industrial or technological revolution. Especially in modern times the so-called natural habitat has been more effectively modified by human action than by physical and biotic processes. Man has changed the surface features, the soils, the water, the cover of vegetation, the supply of resources, and even to a certain extent the climate. In many instances he has made these changes consciously, in other cases unconsciously and indirectly. The disposal of his waste products has become more and more critical. Meanwhile man himself has started to multiply as never before, and he has created cities on a scale not dreamed of in past times. Man himself has changed in his attitude toward the earth and its resources, toward nature and his relation to natural phenomena, and toward his own moral responsibility as the custodian of the accumulated wealth of the earth.

It is important to discuss some of the ideas or concepts that appear in this book. None of the ideas are new ones, but as they are touched upon from various points of view by different authors and speakers they are greatly clarified. Conflicts of opinion there are in abundance, and the conflicts are not resolved; yet the nature of the conflicts are more clearly defined than ever before. Especially in the reports on the discussions, the pre-conceptions and personal prejudices of the speakers are repeatedly revealed. Such pre-conceptions are, of course, based on personal experience, and since each person's experience is different, the resulting pre-conceptions differ. It is from the interplay of ideas generated in this way that persons who are not allergic to discussion are enabled to see their concepts illuminated with a new light.

THE PROCESS OF DISCUSSION AND LEARNING

A contribution was made to the theory and practice of interdisciplinary discussion. The background papers were available to be read well in advance. Then the papers were set aside, not to be specifically discussed. The writing and reading of them had served to provide the participants with a common background of intellectual experience, without which it is most difficult for even the most willing minds to make contact.

In such a situation semantics inevitably comes in for attention. The Aristotelian concept of a definition was to define classes of phenomena, such as species and genera. It was necessary to make clear that a biological species is a form of definition, for there was some tendency to confuse a category (a group of like individuals) with a phenomenon (the physical embodiment of a process). The tendency of the humanists—and social scientists, we may add—to start with word definitions or technical jargon and proceed from there was both attacked and defended. The importance

of adding operational definitions, especially where scholars in different fields are gathered together, was illustrated again and again. "A conscientious scholar," said one participant, "will establish (and change) his definitions with care and will endeavor to be consistent in their use. And he will ask others to understand his arguments in terms of his definitions, just as he will likewise treat the ideas of others."

But when operational definitions were used the house was divided into the usual two groups: the unitarians and the separators; the synthesizers and the analyzers; the observers of processes in their total, unsystematic environments and the experimental scientists who isolate those processes that can be measured. The opening paper shows how the view of the earth from the air gives a concept of wholes that is an important antidote to excess of analysis. The question is not whether it is better to be a synthesizer or an analyzer: some people work one way, some the other, depending, probably, on the learning experiences of early life; both make contributions to understanding that can be and should be mutually respected. Rarely can one individual do both well.

Much was made of the importance of defining the limitations of one's data. In this connection the participants were taken to task for "not attempting to use the same sort of concept at different scales, in a way that the physicist, for example, uses the same concept to discuss the very large or the very small." This is one of this reviewer's pet prejudices, and if he had been present he would probably have suggested not only the need for telling "the size of the net with which one catches fish," but also that the fish caught by different size nets are quite different. Especially in dealing with phenomena on the face of the earth, it seems important to stress again that the categories defined at one degree of generalization cannot be the same as those defined at another degree of generalization. Failure to make use of this idea seemed to cause confusion and obscurity in several places.

MAN'S PLACE IN NATURE

The symposium returned again and again to the problem of man's place in nature. It is the theme of *man in nature* or *man vs. nature*. No one was present to argue the case for environmental determinism, although "naive environmentalism" reared its groggy head in a few places, as when one writer insisted that a "difference of climate on two sides of a mountain may create interchange." The concept of the influence of the physical environment on human cultures appeared earliest in the writings of Herodotus, Aristotle, and others, but none of these ancient scholars was so rigid in his determinism as the writers of the 18th and 19th centuries. The concept of determinism was criticized for bringing about a "one-sided preoccupation with environmental influences," and to the neglect of man as an agent of change. Nor is the French concept of possibilism much better, for the "possibilities are in man much more than in nature; they are given to man by his civilization."

Still, man can be a part of nature without having his way of living determined by the natural forces about him. The more fundamental question is whether man is to be considered or considers himself to be a part of nature or separate from nature. It was suggested that in modern times "instead of living with nature, man takes himself out of the biotic community, and thereafter is involved in a fight against nature—a fight in which he has been dangerously successful." Man ceased to be a part of nature, according to some

discussants, when he began to make changes on the face of the earth in accordance with consciously conceived plans. When a creature appeared on the earth capable of remembering experiences and communicating these to others, and of fitting action to consciously formulated plans, something quite new had been added. On the other hand, some of the changes made by man were done with as little conscious planning as that used by a beaver or a herd of buffalo. To a certain extent, then—and if it illuminates our problem to do so—we can think of man as being in nature when his activities are not consciously planned.

EQUILIBRIUM OR CHANGE

The systematic study of the processes of change induced by human action is not one that suggests the use of laboratory methods. The "separators" will, presumably, focus attention on certain measurable processes symbolically isolated, but the greater part of the data must come from observations of unique events set in the total environments of particular places. This does not mean, however, that there can be no search for illuminating generalizations or concepts.

Perhaps the greatest achievement of the symposium was the search for concepts to illuminate three major problems: (1) Is man's relation to the resources of the earth one that must tend toward the establishment of equilibrium or one of continued change, and if the latter, is the change one of progressive deterioration? (2) What sets the limits of economic growth? and (3) What is the distinctive content of the technological revolution?

The question regarding the relation of man to earth resources was raised again and again and discussed from a variety of viewpoints. It was agreed that "man advances materially and ultimately in his civilization by breaking into the stored wealth of the world's natural ecological climaxes." In general, with some exceptions, the ecologists subscribed to the idea that "systems or processes that involve organic activities resemble purely physical systems in being expressions of thermodynamic law in that they were tending to approach a condition of minimum stress and unbalance, a steady state." Humanity was advised to strive toward a condition of equilibrium with its environment, so that the use of earth resources will not represent a net deterioration of the capital base. The biological-ecological view seemed to tend toward the concept of the desirability of equilibriums, and toward flying the danger signals so long as such a balance was neglected.

On the other hand, it appeared to be the socioeconomic view that "all history, geological as well as human, is not a repetition of a cycle. It is an irreversible process of curiously decreasing entropy, that is, increasing complexity of organization." In the social sciences those who view human development in terms of an expanding economy are thinking in terms of a process of change. The extreme conservationists, "who are willing to freeze to death sitting on top of a coal mine, are obviously preoccupied with the process of equilibrium."

Marston Bates, in his summary of the section of the symposium entitled Process, arrived at the idea that equilibriums are essentially illusions. "When we look in a given cross-section of time we are impressed with the balances, the buffer mechanisms, the cycles, that maintain equilibriums. But when we look longitudinally in time, the changes, whether apparently random or directed, impress us the most; the system of

nature appears to be in disequilibrium rather than equilibrium."

Civilized man, clearly, is more than a biotic phenomenon. He is a problem-raiser and a problem-solver, constantly in communication throughout the earth-embracing *noösphere* (from the Greek *noos*, or mind, and *sphaera*). Even if he advances materially by breaking into nature's ecological climaxes, if they exist, he himself builds up entropy instead of tearing it down. "A class, when taught, knows more, but the instructor does not know any less." Nevertheless, the end result of all this was elusive. In the end, those who came to the symposium as optimists had "faith in the conscious and purposive power of science." Those who came as pessimists saw "the destruction of the earth as a consequence of the haphazard and heedless disturbance of the balance of nature."

THE LIMITS OF ECONOMIC GROWTH

The discussion of the limits of economic growth was also spread throughout the papers and the discussions. The basic theory of economic limits was formulated as follows:

> "Levels of human living are constantly rising with mounting use of natural resources.
>
> Despite technological progress we are spending each year more resource capital than is created.
>
> *Therefore*
>
> If this cycle continues long enough, basic resources will come into such short supply that rising costs will make their use in additional production unprofitable, industrial expansion will cease, and we shall have reached the limit of growth."

There were numerous ideas regarding what the words "long enough" might mean. The several specialists were not at all in agreement in their predictions. The British Political and Economic Planning Commission was quoted to the effect that "while there is plenty of iron available in the world, copper will be exhausted in about 50 years; lead, zinc, and tin before 1980; and the supply of other important minerals is likely to be exhausted before the year 2,000." This commission was further quoted: "it would be folly to count, for instance, on technology producing adequate alternatives for lead, zinc, and tin before the existing supplies are exhausted or become excessively expensive." Here, clearly, is the conservative or pessimistic view.

The optimists were also present. Their faith in the advances of technology was based, perhaps, on the numerous gloomy predictions that have proved untrue, or on the success of the scientists in providing alternatives. To be sure the pessimists point out that the use of the new synthetics, like nylon, only replaces a plant product, produced from direct sun radiation, by another substance, coal, that was stored up over vast periods of geologic time. This constitutes more of a capital drain than the soil erosion induced by wasteful methods of cotton growing. The optimists pin much of their hope for the future on the continued development of thermonuclear power. In contrast to the attitude of the pessimists here is what one optimist—also an expert—had to say about the predictable limits:

> "One hundred tons of average igneous rock contain, in addition to other useful elements, 16,000 pounds of aluminum, 10,000 pounds of iron, 1,200 pounds of titanium, 180 pounds of manganese, 70 pounds of chromium, 40 pounds of nickel, 30 pounds of vanadium, 20 pounds of copper, 10 pounds of tungsten, and 4 pounds of lead. Given adequate supplies of energy, these elements could be extracted from the rock, and it appears likely that the rock itself contains the requisite amount of energy in the form of uranium and thorium."

The contrast between the faith of the optimists in continued technological development and the warnings of the pessimists that unless man can create more than he takes from the earth his

way of living will inevitably collapse, was not resolved. Each reader will take his choice, based perhaps on his own subconscious attitude on life. As one cynic puts it, whether one selects the optimistic or the pessimistic view depends more on the operation of one's digestive tract than on one's intellect.

In between the two extreme views, however, there is a middle ground. In this middle view, the outcome is by no means certain. It is not predictable because it depends on the capacity of man to adapt himself to the changing conditions of life. There is more to it than technological progress; for the new technology, the increased use of automation, the decrease of the need for man as a "lifter and mover," means that there will be a great increase in the amount of leisure time. "The evidence is that there will be more jobs as production rises, requiring less time and less effort of each worker per unit of production. . . . Many will have 130 to 150 free hours each week." How is this new leisure time to be used? The basic question that we must face in the future is "Can man survive prosperity?"

It was encouraging, too, to find no disagreement with the prospect that the ocean could supply man with almost unlimited raw materials as well as absorb his wastes as far into the future as it was possible to forecast.

THE TECHNOLOGICAL REVOLUTION

The third of the major themes running through the whole of the symposium was the nature and the results of the technological revolution. There was no disagreement about the concept that a revolution in human living had been started, and is still going on. Again and again the increased tempo of change was illustrated, and its results weighed. In the view of some, we are not sufficiently aroused by the information that "half the coal which has been burned in the whole history of the world has been burned in the United States in the last thirty years." The fundamental question was raised regarding the distinguishing characteristics of the new technological culture, and whether there had been only a change of degree or a change of kind.

Numerous contributions to this theme were made. Commercial as opposed to subsistence economies do more damage to the so-called balance of nature. It was suggested that the former distinction between urban and rural was no longer important in terms of ways of living. The relation between the growth of cities and the "spiral of population" was analyzed. The effect of cities on local climates, and on the pattern of water use—these and many other facts related to city-growth and technological advance were set forth. And the participants, as might be expected, divided themselves into those who thought the city was an unmitigated evil—formless, chaotic, oppressive, destructive—and those who thought the city contained the highest expression of man's achievements. This reviewer wonders whether a correlation could be found between those who view cities with distaste and those who view the possibilities of economic growth with pessimism; and whether, therefore, both are somehow related to the functioning of the digestive tract. In any case, mixed with a sound appraisal of what city-growth means in terms of resource use, there was a certain amount of emotional nonsense.

The philosopher, F. S. C. Northrop, saw the technological society as differing in kind from non-technological societies. The difference has to do with the way man apprehends nature. In the non-technological societies, notably those of the Oriental countries, the natural

features and processes of the environment are those that can be directly observed. The good life is one that is closely in harmony with nature. In the technological society, on the other hand, the things on the face of the earth and the processes that bring them into being cannot be directly observed, or even imagined. A knowledge of nature is gained by "axiomatically constructed entities and relations whose existence is verified only indirectly by way of experiments which confirm their deductive consequences." Only the mathematically trained mind can grasp the meaning of Einstein's mass-energy equation, on which all the developments of thermonuclear power are based. This fundamentally different way of apprehending nature has produced an entirely new culture. And the new society has an entirely unprecedented relation to the resources of the earth.

There are, of course, other changes in addition to purely technological ones that have appeared during the past few centuries. Man's relation to other men used to be guided by what Northrop calls the "Law of Status." Laws were applied differently to people of different status. There never was such an idea as the right to equal treatment before the law. The technological society has been engaged in the substitution of a "Law of Contract" for a Law of Status. These developments in man's attitudes and objectives, as well as the new developments in his technological abilities, are of the greatest significance in understanding his role in changing the face of the earth.

CONCLUSIONS

Only "little minds" would expect such a symposium to reach conclusions, to resolve diversities of opinion or the differing interpretations of the same accepted facts. In truth, each individual grasps at any one time only a part of the whole. More often than not what he thinks he grasps is colored by his preconceived ideas, his subconsciously motivated attitudes. This drives some individuals to avoid disturbing contacts with others, and promotes the ideal of the "lone scholar." But others are inspired, their own views perhaps even modified, by discussions from which personal defensive reactions are eliminated.

There is no doubt that a reading of this book clarifies the concepts that are relevant to man's relationship to the earth. Often clarification is a sharpening up of the differences of opinion. Often clarification shows that some concepts are irrelevant and should be dropped. For example, the distinction between features that result from human action—cultural features—and those that result from natural processes—natural features—would seem to be of little value. It is quite correct to insist that processes of change at least indirectly caused by human action have touched practically every part of the earth's land surface. Are soils man-made features? Many of the participants agreed with Sauer that the evidence points to human action as setting in motion a series of changes producing the world's grasslands. Under the grasslands are the chernozems. Are chernozems, then, cultural features? The distinction would seem to be irrelevant to an understanding of the areal associations of phenomena, and certainly to the changes made by man when he began to farm this distinctive habitat in the mid-nineteenth century.

Yet there is a fundamental difference between man's actions in changing the face of the earth and the actions of any other organism. Man's actions are, or may be, purposive and conscious. He defines a problem and seeks a solution of it. He plans ahead

toward a consciously-vizualized goal, whether ill-advised or not. Changes on the face of the earth made in accordance with a consciously-formulated plan can be distinguished from those not so made, and the consequences of the plan and the action can be assessed. To measure changes it is necessary to establish the character and the arrangement of things at a given cross-section of time and then to note how they differ at a later time. In between, man's relation to the earth is dynamic, perhaps made up of many small and unstable equilibriums, but equilibriums which are ever in process of being broken by continued human action.

And the nature of human action is not pre-determined. Lewis Mumford sums it up in his final remarks under Prospect: "Within the limits of the earth's resources and man's biological nature, there are as many different possible futures as there are ideals, systems of values, goals and plans, and social, political, educational, and religious organizations for bringing about their realization."

BOOK REVIEWS

The Industrial Structure of American Cities: A Geographic Study of Urban Economy in the United States, by GUNNAR ALEXANDERSSON. 134 pp.; maps, including one large folded map in colors; diagrs., tables. University of Nebraska Press, Lincoln, Nebr., and Almqvist & Wiksell, Stockholm, 1956. $6.50. 9¾ x 7¼ inches.

Almost three decades after the publication of Sten de Geer's highly durable essay on "The American Manufacturing Belt," a compatriot of this eminent Swedish geographer, Professor Gunnar Alexandersson, has come forward with another contribution to our understanding of the American economic scene that promises to form part of our standard scholarly equipment for many years to come. The purpose of this slender volume is to furnish an analysis of the American urban economy in terms of employment. In effect, it is as definitive an attempt as we are likely to have in the way of a functional classification of our cities and an interpretation thereof.

Building on the theoretical foundations so ably laid out by Harris, William-Olsson, and other students both in Europe and this country, Alexandersson has carefully devised a rather elaborate classificatory scheme which he describes in detail in the all-important introductory chapter. Central to his system is a subtle, but significant, distinction between two sets of polar concepts: that of the "sporadic" vs. the "ubiquitous" industries, as opposed to the notion of "city-forming" and "city-serving" industries, or the "basic-nonbasic" dualism. The author contends that since a portion of the product of even so highly localized, or sporadic, an industry as automobile manufacturing is consumed within the producing community, the industry is to that degree "city-serving" and that, conversely, even such ostensibly ubiquitous activities as retailing or education can occasionally serve a broader area than the immediate community and thus become to some extent "city-forming."

In order to ascertain the percentage of employment devoted to city-serving production within each of 36 manufacturing and service industries, Alexandersson assumes that this value, which he designates as k, is equivalent to that dividing the lowest 43, or 5 per cent of the 864 American cities with more than 10,000 inhabitants treated in this study, from the remainder in a ranking for a given industry. When this value is subtracted from the total employees in the industry in question, a remainder of 5 to 10 per cent of total employment in all industries qualifies the city as a C-town, 10 to 20 per cent makes it a B-town, and more than 20 per cent places it in the category of an A-town. As is indicated in Appendix I, many cities achieve A, B, or C status in several industries, while some do not attain sufficiently high employment in any direction to merit classification as economically specialized cities. (Alexandersson might have done well to follow Harris' lead and call the latter "diversified cities" instead of abandoning them to limbo.) A serious problem, but one which is left unresolved, is how to vary the value of k so as to allow for regional differences in consumption levels and the significant differences generated in some industries by the varying size of the metropolis.

In setting up the limits for his study, Alexandersson has excluded such areal (i.e., extensive or rural) economic activities as agriculture, forestry, and fishing and has settled upon the local (i.e., intensive or urban) industries, among which he includes manufacturing, services, and, less justifiably, mining and construction. This equation of punctiform economic activity with the notion of urban location leads to absurd statements like "the American mining industry is the least urbanized of the urban industries," (p. 27) but no serious damage is done inasmuch as the discussion of the dubiously urban items is as uniformly interesting as is the remainder of the text. Alexandersson goes to some pains in accounting for his other methodological decisions: the choice of employment as the criterion for economic activity; the selection of the 1950 Population Census for occupational data instead of the 1947 Census of Manufactures; the use of the Census Bureau's "urbanized areas" for cities of 50,000 or more where such data have been published and of the Standard Metropolitan Areas in other cases. The corporate city is employed for cities in the 10,000–50,000 range. Although there is no alternative but to accept data for the corporate city in the case of the smaller metropolis, there is frequently a large amount of daily commuting across its boundaries, a fact that greatly weakens its value as an economic area.

No matter how many times the reader has covered the same ground in our numerous texts on economic geography, he will be delighted with the substantive chapters of this volume in which the author takes up in turn the areal pattern of each industry and its specialized cities and comments on their origin and significance. Professor Alexandersson brings to this chore the freshness of outlook of a non-native observer, a wide acquaintance with the American literature, and the keen, intuitive insight of an excellent geographic mind. It is surprising how much information and interpretation has been packed into so few pages, and how deftly; but the reader who is aware of the dynamic character of our urban occupational structure will probably be disappointed in the author's failure to paint anything but a static picture of the situation. It is gratifying to note that the reader is almost never made aware of the fact that the writer is using anything but his native tongue.

The numerous maps illustrating this study must come in for special scrutiny since, as Alexandersson has declared, the text is intended chiefly as a guide for their interpretation. These maps, excepting a few miscellaneous items, fall into two groups—the 16 on which the absolute numbers of employees have been plotted and the 21 "relative" maps which show only cities of A, B, or C status. The first group were drawn at a large scale for exhibition purposes, with black dots representing 100 employees each in small cities and rural areas and proportionally scaled circles for employment in larger cities. It is most unfortunate that the prohibitive costs involved precluded the redrafting of these maps since at the scale used here they dwindle into dismal blurs. The other series of maps, drawn in black and white, are excellently designed and reproduced; but some question can be raised over the suitability of the symbolism. For each of the industries shown, the A, B, and C towns are identified by means of patterns superimposed on rectangles which are scaled proportionally to represent the total population of the city. But since the matter of total population is neatly taken care of on the beautifully printed multi-color frontispiece figure, which, incidentally, shows percentage of total employment in manufacturing, would it not have been much more informative to plot just the number of employees within each of the given industries whose output performs a "city-forming" function, especially since these absolute figures are not offered anywhere in the volume? Although this is a handsomely made book, aside from the foregoing reservations concerning some of the maps, there was one serious oversight—the absence of a table of illustrations or a general index, which, of course, makes it difficult to locate specific drawings and topics.

It should be clear from the preceding that, while the Alexandersson formula is not necessarily the last word in the economic classification of cities, it does represent a substantial advance over previous systems, and that its application to the United States of 1950 has given us an extremely useful tool for both research and teaching. It is to be hoped that the technique will be widely applied to practical problems of city and regional planning as well as to further theoretical studies of the American economy, and that Alexandersson will continue his work in a subject which he has already greatly enriched.

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Population Growth and Levels of Consumption—with Special Reference to Countries of Asia, by HORACE BELSHAW. xxix and 223 pages; tables, index. Institute of Pacific Relations, New York, 1956. $4.50. 8¾ x 5½ inches.

This volume is one in which a professional economist projects his thinking about current and future economic problems into the realms of other social scientists, using the countries of southern and eastern Asia as the locus for the discussion. His concern in this volume is the race between the growth in population and the rise in productive capacity of the economy in the several countries of southern and eastern Asia; the volume in turn is a segment of a wider program of study in the economic growth of under-developed countries. The author has been connected with United Nations projects and commissions in southern Asia for a decade, and is as at home with the practical working phases of economics in the field as he is in the conceptual aspects of his subject. This is not a volume to be read at a sitting; nor is it a volume of concern just to those interested in Asia, but one meriting serious study by all geographers interested in the problems of underdeveloped countries the world over.

The term "levels of consumption" requires some elucidation, as Belshaw uses it. This term covers one aspect of the commonly stated concept "standard of living" which, to Belshaw, frequently is misused. Standard of living contains at least three other aspects: namely, standards of consumption, levels of living, and standards of living. As Belshaw defines them, the level of consumption refers to the aggregate of goods and services actually used up by a person or a group, and has reference to the actual functioning of personal or societal economy. Standard of consumption is the level of consumption aspired to, a measure against which the existing level can be gauged. Level of living includes, beyond actual consumption

of material goods and services, various non-material phases of the life of a person or a society, and is an expression of the existing culture-level. Standard of living represents the whole cultural complex value system aspired to by an individual or group. Standards aspired to, both in material living and in the wider phases of living, normally are higher than the levels achieved; in an analysis of whether the under-developed regions of the world are improving their lot, it is necessary to distinguish between their aspired standards and their levels of accomplishment. This is an important practical distinction which regional and economic geographers often have not put across, one which I find poorly expressed in my own teaching and writing.

Belshaw seems to alternate between the viewpoint that population increases tend to absorb increases in productivity so fully that no increase in the level of consumption does occur, and the more optimistic viewpoint of a UN commissioner that a "breakthrough" can be achieved in the rate of increasing productivity to promote not only an increase in the level of consumption but also an increase in the standard of living. In Part I, dealing with current populations of Asian countries, the author attempts to demonstrate that, by and large, the Malthusian formula seems to be working. Considering war as one of the Malthusian checks, the Asian population growth rates have not been able to approach the biologically feasible rates, and he considers that, over-all, levels of consumption are still lower than during the period preceding World War II.

Part II considers future developmental relations in the several Asian countries. Here the author discusses the several variables of economic development as they may apply to under-developed countries in general. These variables, topically stated are: population and its effective productive element labor, capital funds and their investment, economies of scale, technological innovations, and the law of factor returns. The latter three particularly, in the future, relate to the general issues of industrialization. In a sense all the variables relate to industrialization in under-developed countries with high population densities. A rise in levels of consumption in a population still growing markedly would require improvement ratios in all variables and not simply increases in index of accomplishment. Increases proportionate to population in labor force or capital resource may only sustain present levels of consumption despite the cultural spread of ideas contributing to higher standards of consumption and living.

Though Part II is written with a theoretical orientation for all under-developed lands, it does point up the problems for Asian countries particularly, often with comparative references to more developed countries. Such is the generalization that Asian savings, adding to capital resources, run only slightly better than four per cent of the annual income, in contrast to the average of over ten per cent in developed countries. The Indian Five Year Plan is finding itself in difficulty because of the low rate of domestic capital investment, a rate restricted by low percentages of savings of annual incomes. Increasing the productivity of labor is an extremely difficult thing in societies used to employing young people before they are technically skilled or educated, and used to having members of all age groups suffer seriously from disease, malnutrition, or other enervating causes. If material advancement in levels of consumption is going to be achieved, technological innovation will have to come; the refusal of technological innovation because of the dangers to old cultures (as among many followers of Ghandi) must be transformed into an acceptance of technology accompanied by a creative process applicable to culture. This latter needs to be a culturally innovative transformation and not just a process of accepting occidental culture. But how to get this essentially cultural process of societal innovation in all manner of aspects going in societies not accustomed to rapid change is proving a serious stumbling block among peoples who are chiefly village dwellers and highly personalized, rather than anonymous members of huge urban communities.

One chapter of conclusions, in Part III, summarizes the theoretical argument with five lines of approach applicable to the issue of raising levels of consumption. These are: 1, increasing the rate of capital formation; 2, effective use of capital to generate increased national income; 3, improvement in the use of labor forces; 4, the promotion of innovation; 5, slowing down the rate of population increase. A second chapter of conclusions examines these points in terms of possible improvements in the several programs of international aid. This chapter is not a grand plea for more aid as such, but is a plea for more intelligent application of the aid that is already programed, assistance that can productively offer aid in cultural environments different than those of the developed countries which now furnish the aid. Two short appendices applicable to the improvement of international aid and an index complete the book. There is no organized bibliography, but there is voluminous documentation in footnotes of materials from all disciplines useful to the theoretical and practical structure of the volume.

This is both a stimulating and a thought-provoking volume, and it is to be hoped that the author will continue with the other segments of his studies of under-developed countries. To economic geographers accustomed to look for the latest statistics of increasing or decreasing production as constituting the chief matter of

economic geography here is some good sound reading in theory which can benefit the field.

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India's Mineral Wealth, by J. COGGIN BROWN and A. K. DEY. xxiv and 761 pp.; maps, diagrs., ills., tables, bibliogr., index. Oxford University Press, London and Bombay, 1955; 3d edit. $7.95. 8¾ x 5½ inches.

For anyone who needs information regarding mineral resources of commercial importance in India, Pakistan, and Burma, there can be no better recommendation than to look into Brown and Dey's exhaustive volume. The occurrences and exploitation of six types of mineral fuel, 42 metals, some 50 precious and semi-precious stones, and 60 or more different materials used in ceramics and construction are described in 17 chapters and catalogued in a 32-page index. A selected bibliography of 20 pages contains references to sources of fuller information on the most important mineral deposits. In addition, there is one chapter on water supply and one on soils. Economic and regional geographers concerned with southern Asia should avail themselves of the factual information compiled in this authoritative volume.

The first two editions of the book, which appeared in 1923 and 1936, were prepared by Dr. Coggin Brown, an Englishman formerly Superintendent of the Geological Survey of India. In the present revised and greatly enlarged edition he has had the collaboration of Dr. A. K. Dey, an Indian, who is the Superintending Geologist of the Survey. The inclusion of Burma as well as Pakistan, and the exclusion of Ceylon from the area covered is a carry-over from the period before 1937, when Burma was a province of British India and Ceylon a separately governed Crown colony beyond the purview of the Geological Survey of India.

The period covered in the statistical tables of production, exports, and imports generally begins at the end of the 19th century and terminates in the late 1940's or with 1950. Statistics for mineral production and trade in Burma terminate in most instances with 1939, due to World War II and the ensuing political disturbances making impossible the operation of mines and oil wells. Tabulations of total production in the Republic of India are brought up to 1953. The United States reader must look to the Bureau of Mines' *Minerals Yearbook* or to the *United Nations Statistical Yearbook* for more recent data if he does not have access to *Indian Minerals* or other periodicals issued by the governments of the countries.

Most of the basic information on mineral resources contained in this volume dates from the several decades of systematic exploration conducted under British leadership prior to World War II and the post-war governmental changes. A large proportion of the contents, as the title indicates, are concerned with the resources of the Indian Republic, an emphasis which is not undue in view of the larger area of India and the much greater variety of its mineral deposits as compared with the other two countries. Much new information on water supply, soils, coal, iron ore, and other minerals is being obtained by Indian scientists, and certain amendments to the previous edition were incorporated in the present edition. In some technical fields the status of knowledge is so inadequate that fundamental revision is not feasible. The several soil categories recognized, for example, are based almost entirely on the topography, parent material, and peculiar local characteristics of soils in the subcontinent. There is no agreement as to how they are to be reconciled with categories, derived from the climatic and vegetation factors in soil genesis, applicable in the middle latitudes. It is probable that the information on Pakistan's resources is somewhat outdated, because of the recent work of the Pakistan Geological Survey aided by foreign specialists. In the case of Burma, the need for renewal of scientific endeavor is obvious.

Geographers will be interested in the many clear, even if old, photographic and cartographic illustrations. Especially worthy of note is the two-color geological map of Bihar and adjoining areas (Map III) and the three small-scale maps of India, Pakistan, and Burma showing: geological formations with Stamp's climatic regions superimposed (Map X); annual rainfall with the major river watersheds superimposed (Map XI); soils in relation to "arid," "semi-arid," "humid," and "very humid" climatic regions, the basis for which is unexplained (Map XII).

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The Core of the City, A Pilot Study of Changing Land Use in Central Business Districts, by JOHN RANNELLS. xxix and 237 pp.; charts, sketches, diagrams. (Publications of the Institute for Urban Land Use and Housing Studies, Columbia University.) Columbia University Press, New York, 1956. $5.50. 9¼ x 6 inches.

"While some degree of order is to be seen in these [central business district] patterns of activities and their accommodations, the situation as a whole is very confused, with many evident inefficiencies and conflicts. Surely it must be possible to arrange things better!" This observation appears at the conclusion of John Rannells' extensive study of changing

conditions in the center of Philadelphia, though it could be an expression of dismay at the end of any similar study of an American city.

Intimacy with the American city is both a stimulating and a disheartening introduction to the parallel genius and waste of our urban culture. We cannot fail to be intrigued by the constructive contribution this culture has made; its development of a new style of architecture during the last ten years which has broken away from the academic rigidity of the International Style, its fostering of rational organization in the distribution of goods and services, and its most significant contribution—a new form of city with new means of communication, new concepts of areal and structural differentiation, and new morphological qualities—all of which have established for the American city a true identity far more real than that of most West European cities which are more closely dogged by their inheritance. But along with these constructive aspects of American urbanism go the wasteful, the inefficient of which Rannells speaks. That we have not learned as yet how to live in this milieu is our most obvious fault, but, in addition, we might cite the uneconomic mixing of uses in our cities, the too rapid obsolescence of our urban structures, the criminal waste of human energy and time in the urban journey-to-work, and the failure to achieve cohesion and a pleasing texture in our cities.

Although Rannells does not prove so bold as to assign the blame along with the genius, we might well say that the United States, unlike almost any other western country, had no significant urban tradition due obeisance, had the freedom that allows the individual to squander and thereby advance rapidly, if at great cost, and chose to praise innovation rather than the established order. These qualities made American urbanism, but they also made its problems which this book sets out to evaluate. Our cities far more than our economic system exemplify "free enterprise," the guise under which the individual may place his interest above the interests of society, for this freedom has lasted far longer in urban areas than in the economic realm. Only now are we beginning to add up the social costs of this personal freedom. Therefore, planners are seeking to evaluate the changes which continuously characterize our dynamic city cores and to rationalize these changes in the future. To do this, studies such as *The Core of the City* are badly needed.

The basic purpose of this book "is to establish a factual basis for analyzing phenomena of growth and change in the city center, with the goals of conserving and enhancing urban resources." This purpose is achieved largely through setting up and employing three statistical measures of core characteristics: (1) an index of concentration, (2) a center of gravity, and (3) a radius of dispersion. Thus may be analyzed the extent of the district which is truly characterized by a major land use, where that use is centered, and the extent of its normal spread throughout the district. Rannells uses each of these statistical measures to point out successive locational characteristics for six, later five, major use categories. With this information in hand, it is possible to establish a series of models of the relationships which existed in 1949 among these use categories. Similar models of relationship are established for 1934. A comparison of the two sets of models provides an insight into the quality of change within the core during a recent period of time.

Prefatory to his statistical analysis of the Philadelphia city core the author presents a discussion of the factors to which may be attributed the sorting of uses within the central business district, or any urban area for that matter. These "systems of action," stemming originally from the Regional Survey of New York (1927), help to answer the question "Where do things belong in an urban area," for the planner a question equally as important as "Where are things in the urban area." These systems are concerned with urban activities on three levels—that of the individual, that of the grouping of individuals or the "establishment," and that of the relationships between establishments or "linkages." The establishments form the basis for the study of location and the linkages are the basis for a study of transportation relationships among establishments. The latter were discussed in the first of this series (*Urban Traffic: A Function of Land Use*, Robert B. Mitchell and Chester Rapkin, New York, 1954). Unfortunately, this preparatory theoretical framework remains relatively unused in the present study, but its potential may be realized in one of the proposed succeeding volumes.

An appraisal of *The Core of the City* must remain as divided in conclusions as the appraisal of American urbanism. The strengths are real and important. We do have presented to us a three-part statistical technique which seems to hold promise for analyzing shifts in city cores. But this potential cannot be realized fully until longer time-sequences for a single city and parallel studies in other cities are undertaken. In addition, this book presents cogently a systematic terminology for use in the analysis of these changes. The shifts in concentration, center, and degree of dispersion in Philadelphia during the 15-year period evidenced by statistics serve well to substantiate non-statistical conclusions derived from other studies of the central business district. We find support for the belief that wholesaling and manufacturing are peripheral and allied, that retail establishments are the most widespread element in the district, and that business service is the most restricted element.

The most serious faults of this book lie mainly in presentation. For the geographer the "maps"

will be painful. The absence of even minimal labeling is inexcusable and most confusing to any but the intimate of Philadelphia. Many of the diagrams seem redundant, proving less graphic than the prose that describes them. The failure to utilize the sound theoretical framework presented in the first section of the book has already been mentioned, but, in addition, the repetitive nature of the text reduces the sincere pleasure that this book might afford through its genuine contribution to urban studies. Finally, the format of the work, in particular the absence of an index, is hardly commensurate with the price. When Rannells writes as an architect viewing the city he writes interestingly and economically, but when writing of his statistical work he writes ostentatiously and with unnecessary iteration. The conclusion cannot be avoided that the material has been over-extended to book length. Of particular concern is the confusion regarding the arbitrary nature of boundaries. The author states that the drawing of all boundaries is arbitrary, neglecting the point that though the boundary itself may not exist is reality, the reasons behind the location of a line may be basically objective.

One hesitates to condemn this book despite its over-amplification because it does develop interesting and useful methods for urban morphology. It is to be hoped that these methods will be used in successive studies on finer scale data. In this study five rather inclusive classes of business are analyzed. If these could be expanded to provide a greater range of information on types of business, we would be able to distinguish among types of manufacturing and retailing to some advantage. Certainly, to lump printing and locomotive manufacture, or department stores and corner groceries, is not very enlightening, nor is it using statistics for much more than their own sake. In sum, *The Core of the City* is an interesting but restricted introduction to a subject which is a frontier of urban study, and represents a phase of this study which could help to rectify some of the faults that accompany the strengths of American urbanism.

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Pilot Study of Southern Illinois, by CHARLES C. COLBY. xiii and 94 pp.; maps, tables, diagrams, index. Southern Illinois University Press, Carbondale, Illinois, 1956. $7.50. 11½ x 8½ inches.

This analysis of the thirty-four counties which comprise "southern Illinois" was undertaken with a three-fold objective: (1) to provide knowledge of the livelihood structure of the region, (2) to focus attention on unrealized opportunities in the area, and (3) to point out intellectual unknows calling for further research.

Southern Illinois covers an area of 13,629 square miles (2¼ per cent of the State's area) supporting a population of 676,000 (only 8 per cent of the State total). Almost 390,000 of these people (over half of the region's inhabitants) are concentrated in two adjoining western counties comprising Illinois' portion of the St. Louis Metropolitan Area. The remaining 32 counties are essentially rural and contain only seven cities exceeding 10,000 people. None exceed 16,000. Many counties have no settlement with even 2500 inhabitants.

Southern Illinois was the first part of the State to be settled. In 1820, practically all of Illinois' 55,000 inhabitants resided in this forested region. Population subsequently increased in every decade until 1930 when the Census reported the first loss. The depression years showed a slight resurgence, but the 1940–1950 decade saw a decline of nearly 50,000 people. In the last half of the 19th Century southern Illinois added 640,000 inhabitants; in the first half of the 20th Century the increment was less than 40,000.

The economy was healthy at the turn of the century. Its failure to continue was the result of problems in agriculture and mining, and an absence of any other basic activity.

The present occupational structure shows 31 per cent of the jobs in agriculture, 29 per cent in trade (wholesale, retail) and services, 13 per cent in mining, 12 per cent in manufacturing, and 15 per cent in remaining activit es. The level of income is not only markedly lower than that for Illinois as a whole but also (and more serious) fluctuates sharply from month to month. Less than 10 per cent of the gainfully employed receive their income in twelve monthly installments of a similar amount.

The problem in agriculture is "underemployment" in which large numbers of farmers, although not unemployed, are producing less than what they might. The result is a large number of farms generating very low income. In analyzing the factors affecting agricultural income the author concludes that climate is very favorable, the surface is level enough for mechanized agriculture, and soils in general are not a great handicap, but that drainage is a severe problem almost everywhere. Among the cultural factors the farms are too small to warrant the use of agricultural machinery; in only five counties did the average exceed 150 acres. Capital, as represented by the value of land and buildings, is too limited to provide much borrowing power for improvements. Production methods are backward. An encouraging trend is toward dairying and livestock production for the nearby St. Louis and Chicago market areas. The author recommends (a) a thorough investigation of the claypan soils to determine their location and extent, (b) land

classification, and (c) establishment of at least three agricultural experiment stations to demonstrate cropping practices.

Mining provided an amazing number of jobs (over 40,000) in the peak year of 1923. Subsequently, a general decline in number of jobs has occurred. Paradoxically, the employed miners have fared well with a satisfactory means of livelihood. The author cites the $2.24 average hourly earnings of the nation's bituminous coal miners compared with $1.63 for all manufacturing, $2.10 for petroleum refining, and $2.21 for contract construction. On the other hand, the number of unemployed miners is high. Since mine laborers are particularly immobile, there develops in mining communities a differentiation between employed and unemployed miners breeding dire social consequences.

Manufacturing provides the region with 13 per cent of its jobs. The author presents maps of the nation's locational pattern of manufacturing in general and of selected industries individually, pointing out in each case the position of southern Illinois relative to major producing regions. Low incomes mean that the region is handicapped as a market for industry. From the raw material standpoint its main asset is coal. But its major endowment is a potential labor pool—15,000 unemployed (10,000 men, 5000 women) in the 16 southern counties alone. Unfortunately, the region has a reputation for poor labor-management relations. To remedy this situation (a major deterrent to attraction of more industry), the author proposes an ingenious seven-point program for developing the labor resource.

Transportation-wise the region is particularly blessed with an intensive rail net ("few, if any, other areas in the country possess such an amazing contact with the national railway pattern"), satisfactory highways, and navigable rivers on three sides.

The single greatest long-term asset is its geographical situation relative to the nation's general market (the center of population of the United States is within the area), the Corn Belt, the nation's main manufacturing region, and the populous markets of the midwest.

. Scenic and recreational resources are potentially significant. Nature laid a good foundation in the Shawnee Hills, forests, and rivers. Man should design a plan to blend the natural endowment with the many points of historic interest to produce a picturesque vacationland. The appeal would be to the nation's midwesterners in general but to Chicago and St. Louis urbanites in particular. A clever and well formulated plan featuring a "chain of parks" and a Shawnee Trail is presented. Realistically, the cost of developing the recreational resources is excessive for the region but can be shouldered profitably by the State.

Throughout the study the author's method is to describe the elements of southern Illinois' economy, to point out the problems which exist, to discuss factors which cause the problems, and to suggest both general and, in many instances, specific remedial measures.

The document closes with a ten-point program of recommendations stemming from the substantive findings of the author's research and focussing directly on the problems at hand.

A novel feature is a tabular summary on a separate sheet enclosed in a rear pocket which on one page presents the distillate of ideas in four main columns under the headings 1. Employment, 2. Conditions affecting employment (further subdivided into natural resources, productive plant, regional economy, social organization), 3. Direction of desirable adjustments, 4. Recommendations.

The book is a model for scholars concerned with synthesizing knowledge of numerous facets of a region, analyzing their relationships, and suggesting remedial measures for problem areas. It should be equally useful to authorities charged with responsibility for designing and executing programs for improving underdeveloped areas such as southern Illinois.

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The Future of Arid Lands (Papers and Recommendations from the International Arid Lands Meetings), Edited by GILBERT F. WHITE. ix and 453 pp.; maps, diagrs., ills., index. Publication No. 43 of the American Association for the Advancement of Science, Washington, D.C., 1956. $6.75. 9 x 6 inches.

It is most refreshing to find a book of this caliber; so well edited, so well unified, on so important a topic, and embracing the results of studies by scientists from so many nations and disciplines concentrating their attentions on a single set of problems.

The book contains the principal papers given at the International Arid Lands Meetings held in Albuquerque, New Mexico, in the spring of 1955. But it is far from the ordinary type of "Proceedings," published subsequent to the ordinary scientific congress and composed of a welter of unrelated articles. It is distinctive in that it welds together in a masterly fashion the efforts of specialists in widely-dispersed fields, focusing them all onto a closely-related set of topics.

All revolve about the basic question: "What is the future of the arid lands of the earth?" This is approached in the first part of the book through a broad general discussion by Homer L. Shantz of the problems of these areas, followed by a provocative article by C. E. Kellogg on the role of science in the solution of the problems,

and one by B. T. Dickson of Australia on the challenge of the research and development of arid areas. The latter author stresses the need for teamwork—a need that becomes increasingly apparent to all readers as they progress through the book. For the reader is repeatedly impressed with the ways in which the different disciplines aid each other, and how research and development in radically different fields may interlock. Examples are everywhere: for instance, the recent work of the atomic physicist regarding tritium (radioactive hydrogen with an atomic weight of three, formed in the upper air by cosmic ray bombardments, brought to earth with rain, and disintegrating at a known rate) can be used to ascertain the length of time elapsed since ground water fell as rain, and hence the rate of replenishment of underground reserves.

The second part of the book consists of seven articles concerned with the variability and predictability of water supplies. Thornthwaite contributes a very useful and readable discussion on the use of potential evapotranspiration as a tool in arid-land research; Tixeront, a thorough article on the total water resources of an arid region, using Tunisia as a basis; and Smiley, a brief but interesting report on the methods of geochronology as means for determination of drought occurrences in the recent and distant past.

The focus of attention in the third part is on the greater utilization of the present resources of desert areas. Specialists from widely-divergent fields are called upon: an archeologist, a grazing specialist, a hydrologist, a chemist, a pedologist, and a geographer (Sternberg of Brazil).

The fourth section deals with the prospects for additional water supplies: from the desalinization of water, from re-use of waste water, and from artificially-induced precipitation. The fifth portion considers the potentialities which may result from the genetic development of plants and animals better adapted to arid conditions, and from the recognition of further economic uses of present forms. Of particular interest here is the work of Schmidt-Nielsen on certain physiological adaptations of desert animals, and the agricultural research of Evenari and Koller in Israel.

The final part of the book records the 31 recommendations made by the Conference, covering a great range of topics, but stressing strongly the need for greater interdisciplinary cooperation and communication.

It is unfortunate that a political scientist was not included in the group of authors; for the end-result of most of the suggestions and recommendations made by the Conference and by the various writers rests in the hands of governmental administrators. The recommendations can be either successes or failures depending upon the manner in which they are received by the politician. Thus the results of all the scientific teamwork in the world can be negated by an arbitrary and short-sighted political policy, or by the yielding to vested interests.

One of the most provocative articles is one by economist, Louis Koenig, hidden away in the section on the prospects for additional water sources. Beginning with an analysis of the probable cost of water produced from various artificial sources, he raises the question of the value of the land to which the water is to be delivered. He challenges the present practice of evaluating land in conformance with humid land principles, and has the audacity to question the advisability of using water for irrigation in arid lands. Nowhere else in the book is the matter considered; and herein lies the only blind spot of the book and of the Conference. For it is tacitly assumed by all contributors that the optimum use of arid land, and the ideal end-result of all scientific and technical effort, is to bring it under cultivation. The industrial, recreational, and urban aspects of desert areas are completely ignored.

While Koenig merely raises the question—and then leaves it there—the subject merits serious consideration. With the march of modern technology, the whole future potential of arid areas is being rapidly altered. In this symposium, the effect of the harnessing of solar radiation is discussed briefly as a factor in the desalinization of sea water, but its tremendous range of possibilities as a power source for industry in these sun-drenched climes goes unconsidered. Nor is there mention of the increasing aesthetic appreciation of the desert, with resultant tourist developments whose monetary value bids fair to outstrip that of desert agriculture, and whose inspirational and relaxational values to a harried urban civilization are quite beyond measure. The urbanization and industrialization of some desert areas is inevitable, and will change drastically the influences of many of the factors considered in this book.

But these minor shortcomings do not devaluate seriously the enormous assets of the book: the research results reported, the philosophies elucidated, the fine editing, the high caliber of every article. To the geographer, the conservationist, the ecologist, the interested layman, and even (it is hoped) the politician, it opens new vistas of the potentialities of arid lands. And to the scientist—physical, social, and political alike—it demonstrates remarkably the great value of interdisciplinary communication, and gives a glimpse of the potentiality of interdisciplinary teamwork.

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